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Freezing To Preserve Home-Grown Foods

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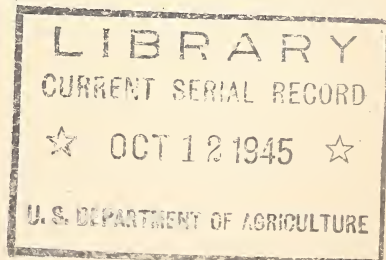
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UNITED STATES DEPARTMENT OF AGRICULTURE

WASHINGTON, D. C.



FOREWORD

Each of us needs about one ton of food each year. A family of five needs some 8,500 pounds of food annually.

Producing and preserving that food at home is always a sound practice. In wartime it helps to reduce the burden on commercial processing and transportation industries and to maintain adequate diets, even in areas that are far from the main channels of distribution.

Most farm families have the skill and equipment to produce this food. Many of them have root cellars, pressure canners, and curing barrels to store and preserve it. With the recent development of automatic freezing equipment, lockers and home-size freezer cabinets, commonly called home freezers, have become available to supplement other methods of preservation.

Freezing is a practicable, desirable way to preserve many foods. The following pages describe the changes that take place during the freezing and storing of frozen food and the methods by which freezing can be used to preserve fruits, vegetables, meats, poultry products, and sea food.

Although a good deal of research has been done on large-scale commercial freezing, there has been relatively little as yet on the preparation and freezing of foods in small quantities for home use. Information based on experiments is, therefore, incomplete on some points, notably the blanching of vegetables for small-scale freezing. As further research is done new facts may come to light which will make it necessary to modify some of the directions or suggestions given.

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UNITED STATES DEPARTMENT OF AGRICULTURE



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INTRODUCTION

Freezing is another means by which families can preserve and store their supplies of fruits, vegetables, meats, poultry, eggs, and fish. Where efficient locker plants or home freezers are available frozen foods can be held satisfactorily for periods of 6 months to a year. These frozen products resemble fresh foods in appearance, flavor, and food value and add desirable variety to the familiar stocks of canned, salted, and cellar-stored food.

The modern frozen food bears little resemblance to the "cold storage" products of earlier days. Improvements in the design of automatically controlled refrigeration equipment have made possible more uniform near-zero storage temperatures. Coupled with this has been the discovery of better methods for selecting, preparing, packaging, and freezing products prior to storage.

Most of the original goodness of fresh foods can be preserved in the frozen product if proper methods are used. On the other hand, even solidly frozen foods will dry out and lose flavor and nutritive value if not properly prepared or stored. An understanding of the changes that may take place in frozen foods will help both the family and the locker-plant manager to guard against loss.

CAUSES OF CHANGES IN FROZEN FOODS

Changes in frozen foods are caused by (1) bacteria, molds, and yeasts; (2) the chemical action of enzymes, or ferments; (3) ice formation during freezing; (4) surface drying or "freezer burn"; and (5) unfavorable storage conditions or too long a storage period.

Bacteria, Molds, and Yeasts

All fresh foods contain bacteria, molds, and yeasts, which will multiply rapidly and cause spoilage if not checked. Growth is rapid at summer temperatures, slow at temperatures around 40° F., and still slower at freezing. A few molds have produced white growths on food at temperatures as low as 18° but no growth has been found at 15° or lower.

Clean foods, prepared with clean equipment and pure water, contain fewer spoilage germs than foods that are handled less carefully. Even under the best conditions freshly slaughtered meats should be hurried to the chill room (33°-40° F.) and fruits and vegetables that cannot be packaged and frozen within a few hours after harvest should be chilled or iced. If fresh foods are not cooled promptly, quality and food value may be lost through bacterial action long before the disagreeable odor of spoilage is noticeable.

Scalding or blanching vegetables destroys some bacteria. Many more are killed by near-zero temperatures, but a few always remain in frozen foods to multiply and start spoilage when the product is thawed. Treat thawed foods as fresh foods and use or cook promptly.

The conditions under which frozen foods are handled and stored

are not favorable to the development of the botulinus toxin. No case of botulism from frozen foods is on record.

Chemical Action Caused by Enzymes

All foods contain chemical agents or ferments, called enzymes, which produce changes in them. Some of these changes are desirable. Beef, for example, is aged or ripened in the chill room for 5 to 10 days to give the enzymes a chance to make the meat more tender. On the other hand, pork is frozen soon after chilling in order to slow down the development of rancidity in the fat caused, in part, by enzymes. Vegetables and some fruits are scalded before freezing to reduce the activity of the enzymes and keep them from causing the development of off-flavors and unnatural colors in the frozen product.

Enzymes produce changes rapidly at summer temperatures, work more slowly as the temperature drops, are sluggish at 40° F. and below, and have weak action at 0°. No economical freezing temperature will stop their action completely.

Although 15° F. is low enough to prevent the growth of bacteria and molds, it is not low enough to reduce sufficiently the chemical changes due to enzymes. Zero-degree storage is needed and is the temperature recommended for locker rooms and home freezers.

Drying, or Freezer Burn

The air in most freezers is dry. This is due to the fact that the refrigerating coils freeze much of the moisture out of it. This dry, cold air drops from the coils toward the floor, circulates around the frozen food and, like a sponge, soaks up all the moisture it can find. Slowly but persistently through the weeks of storage this dry air removes the ice from exposed products. The dry pithy surface that develops on some frozen food is called "freezer burn."

Slight surface drying on food stored in a locker or home freezer is not serious, but under unfavorable conditions it may become severe enough to cause a real loss of quality. It is to prevent this drying that so much care is needed to select the proper vapor-proof wrap or container and to see that the food has been packaged and sealed effectively.

Ice Formation in Foods

When ordinary water freezes, it tends to form pure ice, shoving aside the minerals or other substances that may be dissolved or suspended in it. When water in food juice freezes it does much the same thing, drawing pure water to the ice crystals and leaving behind the coloring, flavor, and food matter that have been dissolved or suspended in it. Freezing is a sort of drying process, producing changes in the composition of the food.

Some of the changes in the food juices of frozen food are not reversible; that is, the normal juice is not re-formed when the product thaws. These changes are small when foods are frozen quickly. If foods are frozen slowly the changes may be so great

as to cause a loss of quality. There is also some rupture or tearing of the tissues as the ice crystals form and expand.

To freeze foods rapidly, temperatures of 0° F. or lower should be used; 10° to 20° below zero are commonly available. Additional effective methods for increasing the rate of freezing are: Spreading the products instead of stacking them; placing them in contact with the coils or plates; and a fan to circulate the cold air over and around them. Food piled in still air at temperatures below zero will freeze more slowly than foods spread out in moving air at zero.

Effect of Storage Conditions

Although the desirability of rapid freezing has been emphasized, proper storage conditions are even more important. Storage may last from a few months to a year or more. Over this long period, the uncontrolled action of enzymes and of drying can cause a serious loss of food quality. The rate of drying will be slower if (1) the food is well packaged, (2) the air temperature is uniform, varying only 1 or 2 degrees above or below zero, (3) the air movement over and around the stored food is slow or moderate, and (4) the temperature of the coils is as close to that of the storage room as possible.

The longer frozen food is held in storage the more time there is for enzymes, drying, and oxidation to produce changes in it. Most well-packaged foods held in a properly designed zero freezer will retain their quality for 6 months to a year or longer. Under poor conditions off-flavors may develop within 3 months.

During an emergency it may be necessary to freeze and store foods under less than ideal conditions. Temperatures as high as 15° F. may be the only ones available for freezing and storing. If such is the case, use that storage and be glad it is available. Foods will not spoil at 15°. However, some quality may be sacrificed and time in storage should be limited to a few weeks or months.

Do not store at temperatures above 15° F., because as already stated, some molds may grow causing changes in the flavor and appearance of the food.

PACKAGING FOODS FOR FREEZING

Stored frozen foods need not be sealed hermetically like canned products, but it is necessary to provide them with an efficient wrapping.

A good wrapping for frozen foods must resist the passage of moisture and vapor, be odorless and tasteless, easy to handle, seal and label, tough so that it won't crack or puncture easily at zero temperatures, economical of storage space, and cheap enough to be practical. No existing wrapper or container possesses all these qualities. Each home processor or locker-plant manager must select the one or ones best suited to the products handled, to the available storage conditions, and to the length of the intended storage period. Various types of containers are shown in figure 1.

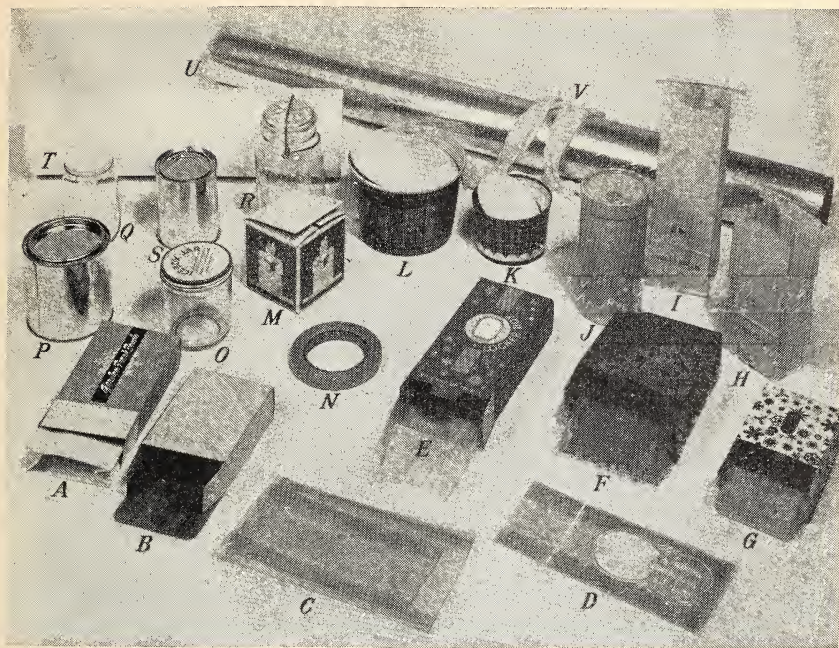


FIGURE 1.—Types of vapor-resistant containers: A, Carton with heat-sealing bag for liner; B, carton with cellophane bag for liner; C, D, double cellophane bags; E, F, carton with cellophane bags for liners; G, cellophane-lined carton; H, I, paper bags with liners for wet and dry packs; J, paraffined carton; K, L, waxed cup with set-in lid; M, cube-shaped carton with heat-sealing top; N, cold-storage tape; O, glass jar with wide mouth; P, tin can with set-in friction-type lid; Q, R, glass jars; S, lacquer-lined tin can; T, waxed wrapping paper; U, cellophane; V, stockinet material.

Containers

Glass jars with tops and rubber rings and tin cans with sealed or friction tops give efficient protection against drying and can be re-used. They may be expensive to buy, however, and they take up too much space in the locker, and glass jars are broken easily.

The special vapor-resistant cellophanes and latex films give almost as efficient protection as glass or tin. They are economical of space, can be heat-sealed easily, and the cellophanes make practical vapor-resistant liners for the more rigid, rugged pasteboard cartons. However, these films are relatively expensive, are difficult to label unless special provision is made, and are not punctureproof or tearproof when tumbled about in the locker.

Fiber cups or bags made of odorless, specially waxed or treated stock give excellent protection against drying, although the available ones are not as efficient as latex and the special cellophanes. The waxed containers are cheaper than those made from special films and are a little easier to fill and label. The wax coating often

makes a fair seal as the lid of the container is pressed into place. Hot paraffin poured around the lid or sticky tape makes an additional seal.

Bags or containers made of laminated paper and other moisture-vapor-resistant materials are satisfactory especially if provided with a locking or sealing device.

Papers for Wrapping

Vapor-resistant cellophane makes an effective wrapping for frozen food. Its chief handicaps are that it is a bit expensive and hard to handle and label and needs protection from punctures and tearing.

Special, odorless waxed paper is widely used for wrapping frozen foods. Like the waxed cups, it will not prevent drying as effectively as the vapor-resistant films but it is cheaper, fairly tough, and reasonably efficient where storage periods last only a few months. The wax may crack where the paper is creased and may chafe off if not protected. Ordinary waxed lunch paper, sold in grocery stores, is only fair protection against drying. If it must be used, double-wrap the product and seal the seams with special cold-storage tape.

Butcher paper or other untreated paper should not be placed against the food since it is hard to remove from the thawed product, may add undesirable flavors to the food, and gives little or no protection against drying. These nonmoistureproof papers are useful only to prevent the tearing of an inner wrap.

In selecting the proper wrapping or container for frozen foods, give the best protection to the products that are to be stored for 6 months or longer, to fruits that are packed in dry sugar, or to vegetables not packed in brine. Use the less effective, cheaper coverings for the others. Seasoned sausage should have airtight protection.

When foods are removed from freezer storage, examine them carefully for drying. In your home freezer or locker the cheaper container may be good enough for long storage or it may be necessary to put a more effective vapor-resistant covering on all foods.

Packaging or Wrapping Foods

Prepare foods for freezing and divide into such quantities as you will wish to withdraw and use at one time. Remove sharp edges or corners from meat (see fig. 21) and poultry that might puncture the paper. Put the meat in as compact a form as possible. This will save storage space and paper and make wrapping easier.

Pull the paper tight against the meat, forcing out the air. Folding the two edges of the paper together as a drug-store clerk wraps a box of candy reduces air leakage through the seam. Fold the ends of the paper together and roll or fold them tight against the food (fig. 2). Tie securely.

If the wrap can be heat-sealed, so much the better. Cold-storage tape is also used to close the seams.

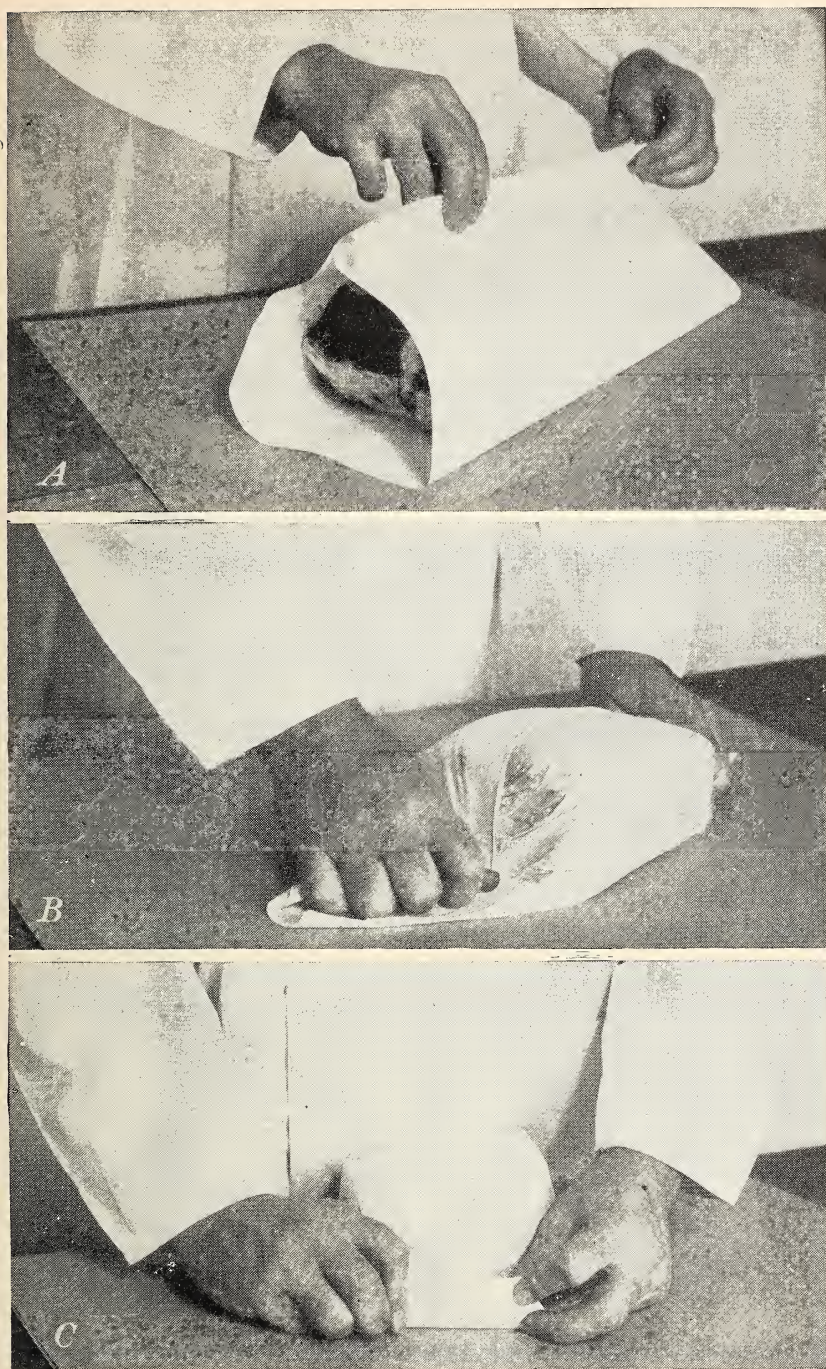


FIGURE 2.—Wrapping meats: A, fold seam; B, pull paper tight to drive out air; C, roll ends and tie or tape ends and seam.

When filling vegetables and fruits into cellophane bags that are to be heat-sealed, use a funnel so as to keep the sealing surface or lips of the bag clean (fig. 3). Settle the foods compactly into the containers, leaving about one-half inch headroom for expansion.

Heat Sealing

Cellophane, latex, and some double-waxed paper can be heat-sealed by heating the top fold of the bag or the seams of the package with a moderately warm flatiron or curling iron (fig. 4). Use just enough heat and pressure to melt the paper or wax until it seals. If too much heat is used and the seal is scorched, a new seal or a new container should be used. If heat sealing is not possible, a good fold of the edges and sticky tape (not ordinary gummed tape) can be substituted. Careful wrapping and sealing are as important as good wrapping material.

Emergency Covers

A home-made bag can be made by heat-sealing the edges of strips of cellophane, latex, or double-waxed paper. A strip of paper 7 by 21 inches will make a 6- by 10-inch bag with half-inch folds along the seam and a 1-inch flap at the top.



FIGURE 3.—Packing sugared strawberries, using a funnel to keep the lips of bag clean.



FIGURE 4.—Heat-seal clean waxed or cellophane lips with only moderately warm iron.

A home-made, partially vapor-resistant covering for cans or jars can be made by dipping clean muslin into melted paraffin. Spread the cloth flat, let the wax harden and cut it into squares large enough to fit well down over the top and side of the can or jar. Warm the square slightly and press it down snugly over the top of the filled can. Tie it tightly with string. This waxed cloth must be handled carefully as it cracks easily.

Glazing

Glazing frozen food with pure water is another home-made wrap. This time the food is wrapped after it is frozen. To glaze foods freeze them first in quantities or blocks desired for a single package. Then dip the block of frozen food briefly in a pail or deep pan of clean water chilled to just above the freezing point. The zero temperature of the food will set a thin film of ice all over the food. Repeat the process every few minutes or as often as necessary to obtain a smooth glaze about $1/16$ inch thick. This ice covering will evaporate during storage and may have to be renewed every few months. It may also crack or chip off if handled roughly in storage. Wrapping the glazed food in paper will protect it considerably.

Fruits and vegetables may be glazed by being frozen in a smooth-lipped can or carton, warmed enough to slip from the can, refrozen, and glazed like meat or poultry.

Frozen meat can be protected with a film of melted lard. Freeze the individual unwrapped steaks, roasts, and other cuts to zero temperature. Dip them briefly (about 5 seconds) in high-quality lard that has been heated to about 200° F. Remove from the lard and hold or hang the cuts for a few seconds until the thin film of lard sets on the frozen meat. Store at near-zero temperature. The thin film of lard will prevent dehydration during a 6- to 12-month freezer storage as well as would thicker coatings made from cooler lard. Cook the fat-wrapped meat as you would any other frozen cut and add the melted fat to the gravy. *Caution: Low-quality lard or lard held too long in the freezer may develop a strong flavor.*

Labeling

Identify each package or container with the owner's locker number, the kind of product, and date of storage. Special stamps, inks, and pencils are made for labeling packages of frozen food. Ordinary lead pencils will not be effective unless the writing is done on strips of cold-storage tape stuck on the waxed coverings. Tags can be tied on if there is no other way. Wrapping paper or tape of different colors can be used to identify various products or different dates of storage.

FREEZING PACKAGED FOODS

Rapid freezing is the next step in producing high-quality frozen foods. Changes in the product will be less marked if the packaged foods are hurried to the freezer and frozen promptly. If it is necessary to hold them for a few hours before taking them to the locker plant put them in the household refrigerator (fig. 5) or as cold a place as possible.

The speed of freezing depends on several factors, among which are temperature, contact between food and the cooling coils, velocity of air flow around the food, thickness of the wrappings, and size of the packages. Slow freezing may result, even at very low temperatures, if products are piled up in still air. On the other hand, rapid freezing is possible at 0° F., if the food is spread out on coils or plates in a rapid air stream.

The freezing equipment in a locker plant usually consists of shelf coils or plates and a fan to speed up the flow of the -10° F. air. These facilities increase the capacity of the freezer as well as improve the quality of the product. It takes approximately 6 to 8 hours to freeze medium-sized packages.

If a locker plant has no special sharp freezer, shelves or a cabinet in the locker room will provide a place to spread out the incoming food. Piling unfrozen products in the locker or home freezer not only reduces the rate of freezing but also warms adjacent frozen food. When foods are frozen in the locker or home cabinet, spread out the packages so that the air can move freely around them. Do not overload.

Freezing at comparatively high temperatures is not recom-



FIGURE 5.—Keep packaged food cold until taken to freezer.

mended but such procedure is better than letting the food spoil. Probably 15° F. is the highest temperature at which freezing should be attempted even with a fan to circulate the air; 10° is about the upper limit in still air. As already stated, some molds will grow at temperatures slightly above 15° .

STORAGE IN FREEZERS

Proper storage conditions add much to the life of frozen foods. Mistakes in selecting, preparing, wrapping, and freezing foods are less serious if the locker-room or home-freezer temperature, humidity, and air movement are right.

A temperature of 0° F. is recommended. At higher levels enzymes are more active and the development of off-flavors and unnatural colors is more rapid. Many foods, like sugar-packed berries and beef, are held with reasonable safety for some time in temperatures of 5° or 10° or even 12° to 15° . Of course, as the temperature of storage becomes higher, the time a frozen product can be held satisfactorily becomes less. Other foods such as pork, fish, snap beans, asparagus, poultry products, and sirup-packed fruits need zero storage if they are to retain their fresh quality beyond a very few months. Temperatures below zero are even better than zero for most foods but are not necessary and are rarely practical because of excessive operating cost.

Of nutritional interest is the fact that the loss of vitamin C in fruits and vegetables is low at 0° F. storage but this vitamin disappears rapidly at higher temperatures. Uniform storage temperatures with a variation of only 2° F. either way are desirable.

The air of many freezers absorbs moisture from imperfectly

wrapped food, depositing it on the coils or plates in the form of frost. One of the best ways to raise the humidity of freezer air and lower its drying tendency is to keep the temperature of the cooling coils not much more than 10° F. lower than that of the room they chill. Thus, if the temperature of the freezing space is zero, that of the coils should not be much lower than -10° . To do this requires excellent insulation, an adequate amount of coil, and a proper adjustment of the compressor. These are engineering problems strictly but their correct solution has much to do with the storage life of foods.

Freezer air blowing across stored food may remove moisture just as the wind dries up a road. Some circulation of air is essential in a storage area, but it should be held to a minimum during the months of storage to keep the rate of drying low.

If the locker is too small to hold all of a patron's food, bulk storage of the surplus for a month or so may be possible. Fitting the frozen packages in a big lard can or a well-wrapped paste-board box will provide additional protection from drying during storage.

A period of 8 to 12 months in freezer storage is practical for almost all foods if conditions approach the ideal. Where temperatures are too high or too variable or where the rate of drying is rapid, each patron will have to determine from experience the length of storage best suited to the various foods under his local conditions. For well-wrapped food held at 0° F. the tabulation on p. 13 will serve to indicate how long foods may be safely stored.

It is not possible or desirable to suggest fixed maximum periods for storage at temperatures higher than 0° F. However, an example or two of the reduction in storage life of the product through higher storage temperatures may be given. It is doubtful if frozen vegetables generally would be satisfactory for more than 6 months at a 15° temperature and some would begin to show loss of quality in 3 months. Some meats are more sensitive to storage conditions. Frozen pork products, for example, may show some rancidity if stored for more than a month or so at temperatures above 15° .

Much will depend on the condition of the product as it goes into the freezer. Therefore, if it is not possible to provide the desirable freezing and storage temperature of 0° F. or below, use great care in keeping the products clean and reducing the time between preparation and freezing.

HANDLING FROZEN FOODS WITHDRAWN FROM THE FREEZER

Thawed foods are an easy prey to spoilage. They must be used or cooked promptly after thawing.

<i>Product</i>	<i>Normal storage period (months)</i>
Sausage and other ground meat	1 - 3
Fresh pork } Fish }	3 - 6
Lamb } Veal }	6 - 9
Beef } Poultry } Eggs } Dairy products }	6 - 12
Fruits } Vegetables }	12 or more

Protection

Frozen foods may lose quality, food value, and even wholesomeness if they are allowed to warm up seriously en route to the kitchen from the locker plant. Wrapping the packages in newspaper is an emergency protection. The best method is to build a portable, covered, insulated wood or cardboard box that will hold the desired amount of food. Excelsior, chopped paper, cottonseed hulls, and composition board are some of the materials that have been used successfully to insulate these boxes.

Thawing

Vegetables, steaks, and chops are often cooked without previous thawing but roasts, poultry, and eggs are usually thawed before preparations for the meal have started. Fruits to be used raw are best if eaten when just thawed. The household refrigerator, if available, is the best place to thaw frozen food. Thawing is so slow at these 40-50° F. temperatures that some of the drip is reabsorbed. In addition, the food remains cold so that spoilage bacteria grow slowly on the wet thawed surface.

Thawing in the open air or by the immersion of a sealed package in 90° to 100° F. running water is rapid and satisfactory for foods that are to be used at once. In any case, thaw the product in its original package to exclude air and prevent discoloration. The characteristic fresh flavor of frozen fruits or fruit pulp is more pronounced if the fruit is eaten after most of the ice has melted or just before the last of the crystals disappear.

Three to four hours is required to thaw a 1-pound carton of fruits or vegetables in air at 75°, and longer periods are needed for larger amounts of these and other foods.

Twelve hours to 2 days is needed for thawing food in the household refrigerator (40° to 50° F.), depending on the size of the package or roast. Safe storage times for completely thawed

foods kept in the refrigerator vary but usually do not exceed 24 hours. Stale odors on thawed meat and poultry indicate that actual spoilage may develop shortly. Foods showing spoilage should be discarded.

In the ice-cube or freezer compartment of a refrigerator (15° to 20° F.), frozen food can be held for 2 to 4 weeks.

The refreezing of completely thawed food is not recommended under any circumstances. However, a small amount of surface thawing does no serious harm if the product is refrozen promptly.

Part of the job of using a locker satisfactorily is the withdrawal of foods on a schedule that will permit their use with a minimum of transportation and without loss of palatability or food value.

COOKING FROZEN FOODS

Proper cooking will save much of the vitamin and mineral values that have been preserved in frozen foods by careful handling. The general rules for cooking are: (1) Use a moderate temperature (300° to 350° F.) for animal products; (2) use small quantity of water in cooking vegetables; and (3) don't overcook. The drippings from meat and the water in which vegetables are cooked may be used for seasoning and soups.

Meats³

Satisfactory roasts and steaks, whether fresh or frozen, can be made only from meat that has enough natural tenderness so that it will be tender when cooked in the oven, broiler, or frying pan. All less tender meats should be braised or stewed with some water or else ground.

Frozen meat may be thawed before it is cooked or during cooking. Meat that is thawed at air temperatures should be cooked promptly as the warm, wet outer surface is an ideal place for spoilage to start. When meat is thawed more slowly in the household refrigerator the surface remains cold and the thawed piece can often be held for a day or longer after thawing is complete, without the development of off odors. It will take a 1- to 2-pound frozen steak 5 to 10 hours to thaw in a refrigerator and a 4- to 5-pound roast about 30 hours. If the meat is thawed first, the cooking time is about the same as for fresh meat.

Cooking frozen meat without preliminary thawing requires a very much longer time than is necessary for fresh meat or for thawed frozen meat. The cooking time for thawed and unthawed beef roasts is shown in table 1.

When steaks or chops are pan-broiled, they are usually thawed before cooking. Thawed steaks and chops are broiled by the same methods and for the same lengths of time as those which have not been frozen. The same methods are used for unthawed steaks and chops but the broiling time must be enough longer to thaw the meat. (See table 2.).

³ See also U. S. Dept. Agr. Farmers' Bul. 1908, Meat for Thrifty Meals.

TABLE 1.—*Time required for roasting frozen and thawed beef to three degrees of doneness at an oven temperature of 300° to 350° F.*¹

[MINUTES PER POUND (Approx.)]

Degree of doneness	Standing rib		Rolled rib	
	Thawed	Frozen	Thawed	Frozen
Rare -----	18	43	28	53
Medium -----	22	47	32	57
Well done -----	30	55	40	65

¹ Data from the Minn. Univ. Agr. Expt. Sta. Spec. Bul. 189.TABLE 2.—*Time required for broiling frozen and thawed porterhouse steaks rare to medium done.*

[MINUTES PER POUND (APPROX.)]

Size	Thawed	Frozen
1 inch thick-----	8—10	21—33
1½ inches thick-----	10—15	23—38
2 inches thick-----	20—30	33—43

All meats, fresh or frozen, should be cooked at moderately low temperatures, 350° F. or lower. This is especially true for solidly frozen meat in order to obtain more uniform cooking from surface to center of the cut. Even so-called boiled meat is cooked in water that only simmers.

Unseasoned thawed sausage may be seasoned with the following mixture, which provides enough seasoning for 4 pounds of sausage.

Seasoning	Level teaspoonfuls
Salt -----	5
Pepper -----	2
Sage -----	2-4

and if desired

Cloves -----	½
or	
Nutmeg -----	1
Red pepper -----	½

Mix the seasoning and knead thoroughly into the meat. Spread the sausage in the refrigerator to chill and cure overnight, or cook at once.

Poultry Products ⁴

Poultry which is to be stuffed must be thawed before it is cooked. Then it is cooked just like fresh poultry. Broilers or poultry cut into pieces may be cooked without previous thawing but additional cooking time must be allowed.

Frozen eggs are thawed in the original package either in the refrigerator, the outside air, or, when time is short, in running

⁴See also U. S. Dept. Agr. Farmers' Bul. 1888, Poultry Cooking.

water. Thawed mixed whites will keep for several days in the refrigerator, but mixed yolks or mixed yolks and whites should be used promptly. Thawed eggs are used just like fresh eggs. One and one-half tablespoons of whites equals the white from one egg; 1 tablespoon of yolk, the yolk from one egg. Eggs cannot be frozen in the shell satisfactorily. The shells crack and the yolks may be cheesy and tough after freezing and thawing.

Vegetables

Frozen vegetables are put on to cook while still frozen or only partly defrosted. To cook put a small quantity of water ($\frac{1}{4}$ to $\frac{1}{2}$ cup) in a pan with a tight cover, salt the water slightly, bring it to a boil, and add the vegetables. Use a fork to help break apart the melting mass so that the steam can reach all parts of the food as soon as possible, cover, and let come to a boil. Begin counting cooking time when water starts to boil again. Remember that frozen vegetables cook in about half the time needed for fresh vegetables. Do not overcook.

Many of the important soluble minerals, vitamins, and flavors leach out of vegetables while cooking. To save them, cook in a tightly covered pan with only enough water to provide steam and prevent scorching.

Corn on the cob is an exception to the rules about thawing. Defrost the corn first so that it will not be necessary to overcook the corn in order to warm the cob. Steaming is preferred to boiling for this product.

Table 3 shows the recommended time for cooking frozen vegetables, and the method—boiling or steaming—that is recommended for each vegetable. In general, boiling gives a better color and steaming a better flavor. For this reason, vegetables with a tendency to strong flavor or bitterness are better boiled and mild-flavored vegetables are better steamed. In some cases, as with peas and snap beans, a choice may be made between color and flavor.

TABLE 3.—*Time recommended for boiling or steam-cooking frozen vegetables*

Product	Actual cooking time ¹	Method recommended
	<i>Minutes</i>	
Asparagus.....	6-10	Boil
Beans, green snap.....	8-15	Boil or steam
Beans, wax.....	10-15	Steam
Beans, lima, Henderson.....	15-20	Boil or steam
Beans, lima, Fordhook.....	8-12	Boil or steam
Broccoli.....	5- 8	Boil or steam
Carrots.....	5-10	Boil or steam
Cauliflower.....	4- 6	Steam
Corn, sweet, cut.....	4- 5	Steam
Corn, sweet, on cob ²	4- 6	Steam
Kale.....	14-20	Boil
Peas.....	5- 7	Boil or steam
Soybeans.....	10-15	Boil or steam
Spinach ²	4- 6	Boil or steam

¹Actual cooking time starts in the boiling method when the water boils after the vegetable is added, and in the steaming method when a heavy cloud of steam rises to the top of the utensil after the vegetable is added.

²Partially thaw before cooking.

Fruits

Frozen fruits are used, for the most part, uncooked and not quite defrosted. They are served like the fresh fruit. The smooth texture of sugar-packed, quick-frozen fruit puree makes it delicious when served frozen without further preparation.

Frozen fruit juices are best when a few ice crystals are still floating in them. Do not dilute unconcentrated juices by adding more ice.

Fruits frozen without sugar are often put unthawed into the cooking utensil or into hot sugar sirup for baking or preserving. This method retains most of the characteristic fresh-fruit color and flavor.

THE PLACE OF FREEZING IN THE FOOD-PRESERVATION SCHEDULE

Of the 8,500 pounds of food ordinarily needed each year by a family of five, over 2,500 pounds of meat, poultry, sea food, fruits, and vegetables can be preserved satisfactorily by freezing. Even by staggering production throughout the year, it will rarely be possible to put more than 700 to 1,000 pounds of food through a single 200-pound-capacity locker in 12 months. The whole family can help decide which foods to freeze and which to can, cure, dry, or store in other ways. In most homes, beefsteak, pork chops, peas, asparagus, and berries probably have first call on locker space. The next choices would be beef roasts, pork loin, frying chickens, lima beans, corn, cherries, and peaches.

If the year's food supply has been budgeted, foods for freezing can be selected also on a seasonal basis. Thus part of the March-stored beef will be out of the locker when space is needed for the summer rush of garden truck. In like manner part of the fruits and vegetables will have been used when room is needed for storing the meat from an October-dressed pig.

Ham, bacon, and pork shoulders are good meats for curing. Beef stew, ground meat, and older poultry are often canned.

Almost all vegetables may be canned successfully. A common procedure is to can most of them and freeze part for variety.

Making preserves, jams, and jellies will take care of part of the fruits to be preserved and relieve pressure on the locker or home freezer. Some of the peaches, plums, cherries, and grape juice can be canned and stored in the cellar. Root crops, cabbage, and apples can be held in a ventilated cellar or cave.⁵

Freezing is best used to supplement other methods of food preservation.

PREPARING ANIMAL PRODUCTS FOR FREEZER STORAGE

Meat Animals

Selection.—Thrifty, moderately fattened animals provide the most desirable meat for freezing. A good finish adds palatability

⁵See U. S. Dept. Agr. Farmers' Bul. 1939, Home Storage of Vegetables and Fruits.

to the lean, but excessive fatness is unnecessary. Select animals with the weight that will give the size of steaks and roasts desired. Popular weights are: Hogs, 200-250 pounds; calves, 150-250 pounds; steers or heifers, 600-1,000 pounds; lambs, 70-100 pounds. All animals must be healthy. Suitable veterinary inspection is available in many localities and its use should be encouraged.

Slaughtering.—Whether slaughtering is done at home or at the locker plant a good, clean job of dressing is important. For example, the head and feet of a hog, often discarded because poorly cleaned, constitute 9 percent of the live weight of the animal. Bruised meat or meat that has become dirty in dressing or hauling does not keep well and should be trimmed off. Complete slaughtering directions may be found in State and Federal bulletins on farm butchering.

Chilling.—Most meat spoilage results from delayed or imperfect chilling of warm, freshly slaughtered carcasses. Spoilage germs may produce a taint within 12 to 18 hours if the carcass is not chilled promptly. Artificial refrigeration is essential if the air temperature is above 40° F. Chill-room temperatures of 33° to 36° are customary. Prevent freezing, if possible. If the carcass does freeze, thaw it slowly, as in the chill room, and process it normally.

To cool meat promptly, even in the chill room, carcasses must be hung so that they do not touch. Open the body cavity or better still, split the carcass, and, in hogs, drop the head, and pull out the blanket of leaf fat.

Aging chilled meat.—Pork, veal, and poultry are cut, packaged, and frozen as soon as they are thoroughly chilled. The tenderness of beef and lamb will be increased if the meat is allowed to hang in the 33° to 40° F. temperature of the cooler for 5 to 10 days after slaughter. During this storage the connective tissue is somewhat softened. A 5-day ripening period is long enough for carcasses that are not well protected by fat or for meat held in damp coolers. If they are held longer, mold may develop on the exposed lean surfaces, necks, and flanks, producing undesirable odors and flavors. Even with careful trimming, these stale flavors are apt to reappear when the meat is thawed and cooked. High-grade beef ribs and loins are often held for 6 weeks in dry commercial coolers but this prolonged ripening is unnecessary for meat that is to be somewhat tenderized by freezing. Seven to 10 days appear long enough for well-fattened beef and lamb and 5 days is probably better for thin carcasses.

Cutting meat.—Since cooking methods must be adapted to the tenderness of the meat to be cooked, the proper cutting method separates the tender steaks and roasts from the pot roasts, stews, and other less tender cuts.

Properly ripened beef carcasses from 1- to 2-year-old, well-fattened cattle produce more tender meat than carcasses from older, thinner animals. Yet even the best carcasses contain many "working" muscles that are too well filled with connective tissue

to be tender unless that tissue is slowly softened by braising or stewing. The thin, less tender shanks, neck, brisket, plate, and flank must be prepared for pot roasts or ground.

The thick, working muscles of the shoulder and round from young, well-fattened cattle often make reasonably tender roasts and steaks. They are, however, more truly pot roasts and Swiss steaks and are not so well adapted to cooking in the oven and frying pan as the meat in the rib and loin, (rib roasts, T-bone, and sirloin steak). When the carcass is from a thin, older animal even the loin and rib cuts may be better suited to braising than to frying. Part of the meat cutter's task is to size up the quality of each carcass handled and cut it in accordance with the way its various parts should be cooked.

Figures 6 to 22 show the approved method for cutting up a beef carcass for freezer storage.

The size of roasts, number of steaks, amount of ground meat, proportion of fat in the sausage, and the quantity in each package must be decided by the family. Thickness of the steaks can also be suited to the owner's preference. One of the advantages of a locker is the opportunity to have inch-thick steaks at all seasons of the year. Thin steaks may dry out too much if held for several months in the locker.

All the cuts of lamb, even the breast and neck, can be made tender by slow roasting. Lamb is cut up for freezer storage in the manner illustrated in figures 23 and 24.

Boning all the cuts from a side of beef or lamb reduces the storage space required in a locker about one-fourth. It also increases the cutting or processing work or charge. Trim all cuts closely to save space. Sharp edges of bone that may puncture the wrapping paper should be removed.

Pork carcasses are cut as soon as they are thoroughly chilled, usually within 48 hours after slaughter. It is customary to separate the thick, leaner hams, shoulders, and loins from the thin, fatter bacon strips and head (figs. 25 and 26). Surplus fat is trimmed off for lard.

Curing, smoking, sausage making, and lard rendering can often be done at home.⁶ The family must decide whether the extra expense of locker plant service is warranted.

Sausage is often frozen without seasoning as the aromatic flavor of the spices may disappear during several months of storage. If the seasoning is added before freezing be sure that the meat is packaged in a vapor-resistant wrap or container.

Game

The freezing and storage of game meat is definitely restricted in many States. The local game warden and fish commissioner should be consulted before game is shot or brought in for freezing preservation.

Warm, freshly killed game needs even more prompt attention to

⁶See U. S. Dept. Agr. Farmers' Bul. 1186, Pork on the Farm.

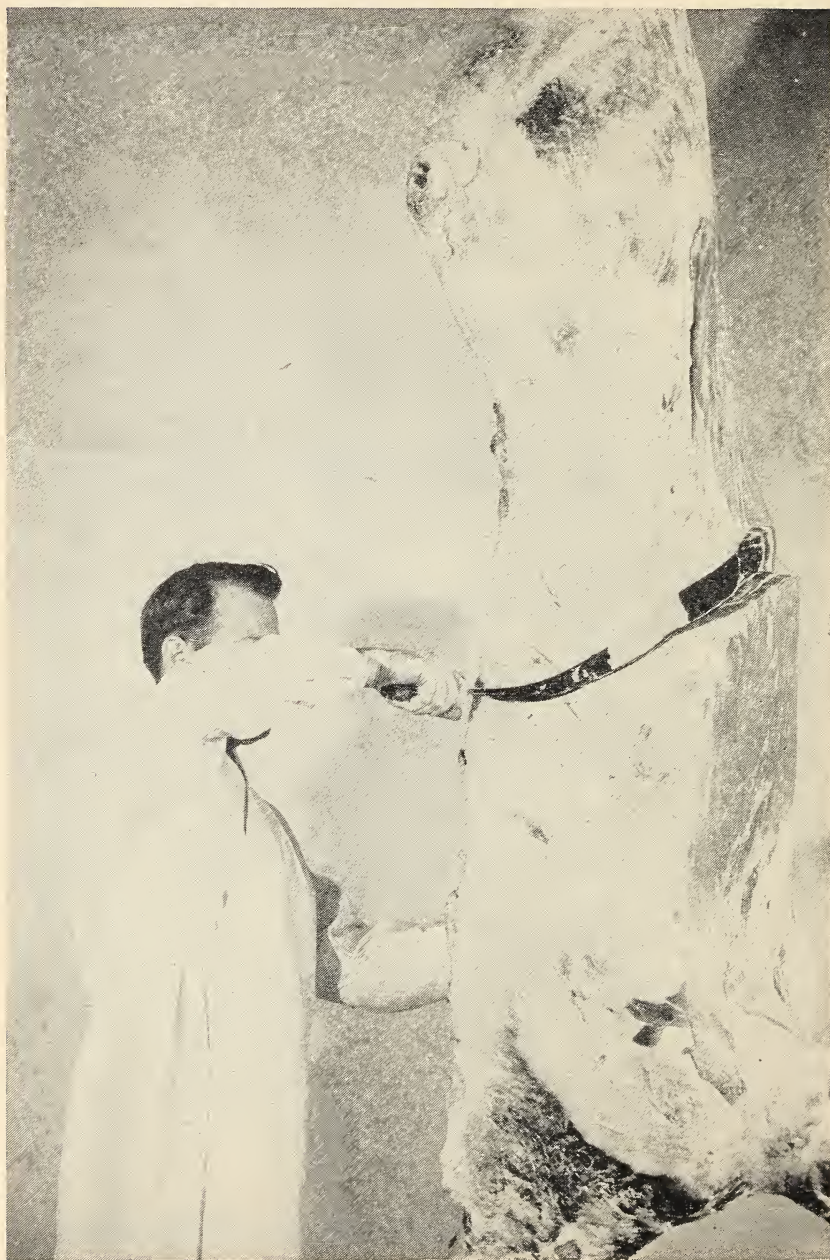


FIGURE 6.—Cut forequarter from hindquarter between the twelfth and the thirteenth or last rib.

FIGURE 7.—Divide fore-quarter by removing rib and plate (*a*), from the chuck (*b*), between fifth and sixth ribs.

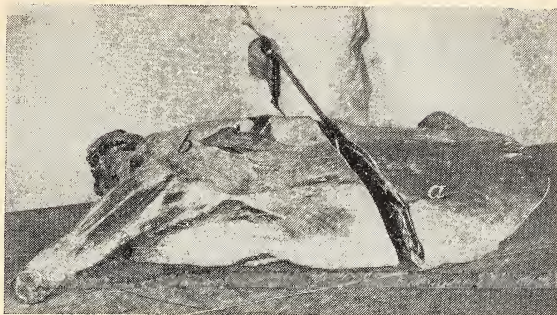


FIGURE 8.—Bone front shank by cutting behind arm bone from elbow (*a*) through shoulder joint (*b*), and along front of arm and shank. Hug the bone with edge of knife.

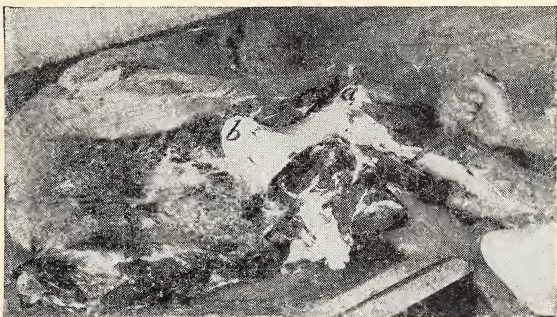


FIGURE 9.—Cut thin brisket (*a*) from thick chuck (*b*).

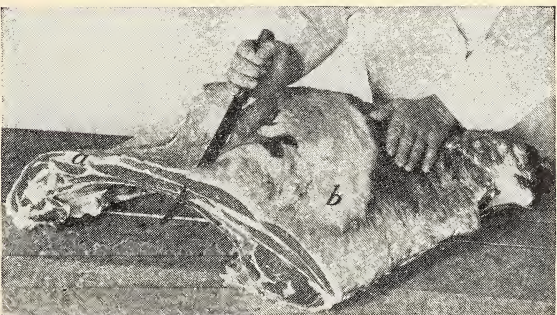
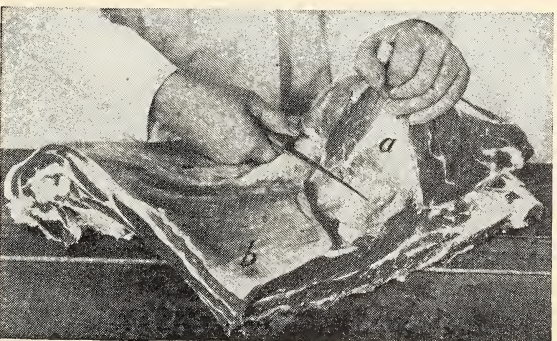


FIGURE 10.—Lift thick clod roast (*a*), from brisket (*b*), at the natural seam.



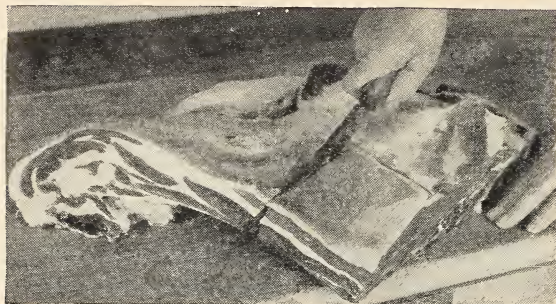


FIGURE 11.—Cut rest of brisket and the plate into short ribs.

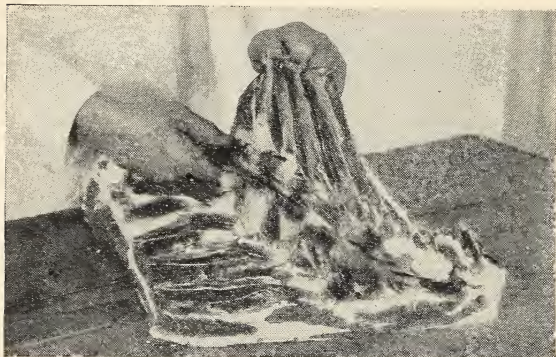


FIGURE 12.—Bone and roll for pot roast.

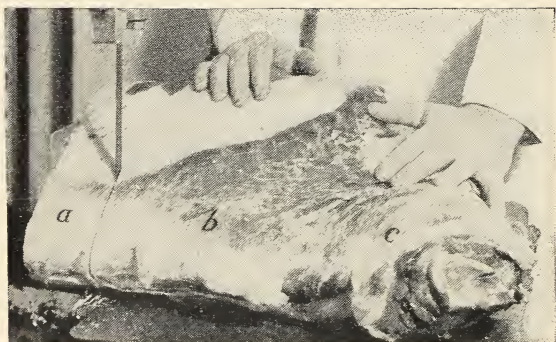


FIGURE 13.—Saw chuck ribs for roasts (*a*), or pot roasts (*b*), bone neck (*c*), for grinding.

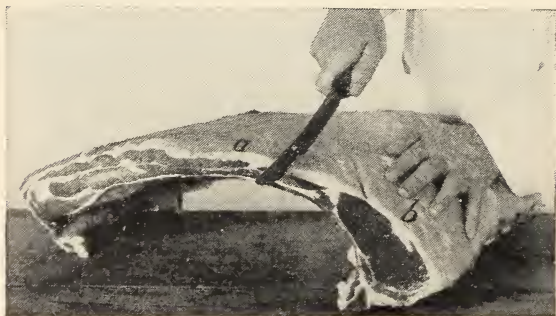


FIGURE 14.—Cut a long plate (*a*) from short rib roasts (*b*).

FIGURE 15.—Cut the thin flank (*a*) from the thick hindquarter (*b*).

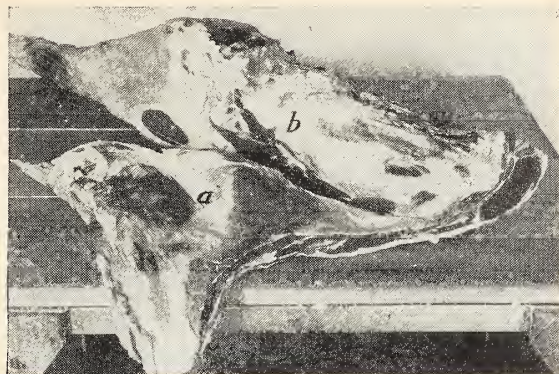


FIGURE 16.—Saw the round (*a*) off just behind the aitch bone (*b*).



FIGURE 17.—Saw the rump (*a*) from the loin (*b*), 1 inch in front of aitch bone (*c*), across the fourth vertebra from pelvic rise.

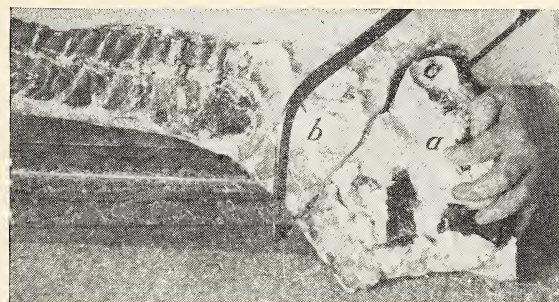


FIGURE 18.—Cut the loin into sirloin steaks (*a*) and T-bone steaks (*b*).



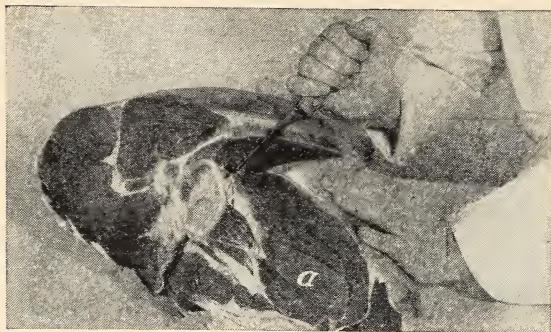


FIGURE 19.—Cut the tip (a) from the round.



FIGURE 20.—Lift the round bone (a), split top round (b), from bottom (c), for boneless roasts and steaks; bone hind shank (d).

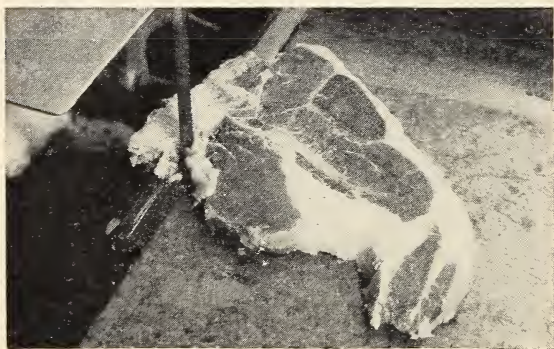


FIGURE 21. — Trim sharp bones from steaks and roasts.

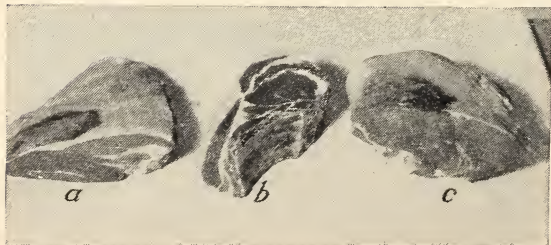


FIGURE 22.— Boneless clod (a), trimmed rib roast (b), and bottom round roasts (c), ready for wrapping.

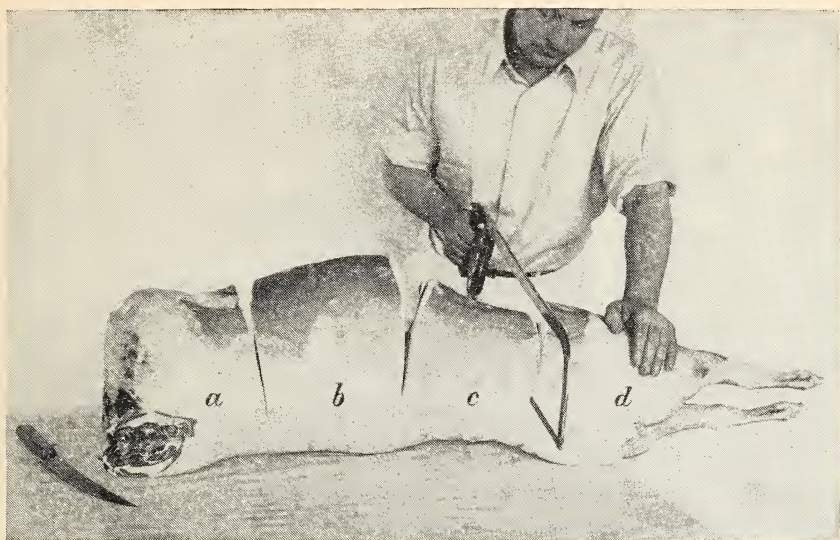


FIGURE 23.—Cuts of lamb: Five-rib shoulder (a), rest of ribs in rack (b), loin (c), legs (d).

bleeding and chilling than domestic meat animals. Spoilage starts quickly, especially in muscles that have been torn or bruised by bullets.

Deer and other big game should be stuck and bled promptly. Hanging and dressing the carcass will speed up chilling. In warm weather, it may be desirable to skin large game at once so that overnight chilling will be more rapid. Venison is then handled and cut in the same way as beef. Separate the thick round, back, and shoulder muscles from the thin ribs and flank.

Small game animals, such as rabbits, should be skinned, dressed, washed and chilled promptly. Only the thick back and hindquarters are usually frozen in order to save locker space. Ribs, neck,

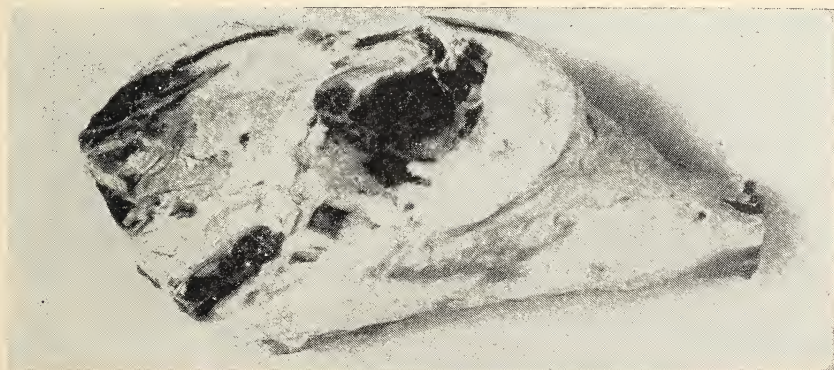


FIGURE 24.—Trimmed leg of lamb.

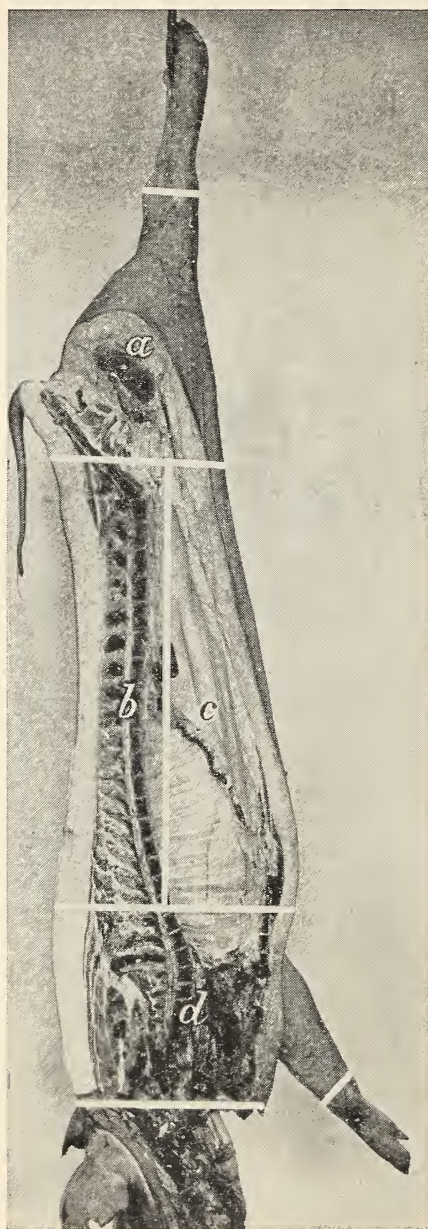


FIGURE 25.—Cuts of pork. Ham (a), loin (b), bacon (c), shoulder (d).



FIGURE 26.—Cut fat back from loin of pork.

and forelegs can be stewed while fresh to better advantage. There is little protective fat on small-game meat, so it should be well protected against dehydration in locker storage.

During the winter in the North, rabbits can be dressed, frozen overnight, and packed with clean snow in a barrel. A protected barrel of frozen game will withstand thawing weather for several days, though this period should not be too prolonged.

Poultry

Only healthy, plump, well-fattened birds of the age and weight suited to the family should be selected. Birds should be fasted, but allowed water, for 24 hours before slaughter. Hanging them by their feet for killing and bleeding is recommended. It prevents bruises in the meat.

Birds can be dry-picked, though "slack" scalding is an easier method for most people. The thoroughly bled birds are moved around in water at 128° F. for 30 to 60 seconds. Feathers may be still a little tight but there is no danger of overheating the skin as when 150° - 160° water is used. In the latter case, feathers will slip off easily but patches of "cooked" skin may spoil the appearance and lessen the protection against drying during storage unless scalding is done carefully.

After the pin feathers are removed, the clean carcass is singed, washed, and chilled, ice water being used if necessary. Overnight chilling in a room temperature of 32° to 36° F. is satisfactory. Hang the birds so they do not touch each other.

Chilled poultry may be dressed for freezing and storage in three ways:

(1) *Roasters*.—Large, well-fleshed birds are left whole. Remove the entrails, crop, neck, and feet and tie the legs and wings tight to the breast to save storage space. Figure 27 shows how to wrap a roasting chicken for freezing.

(2) *Broilers*.—Cut off the head and feet and split the young, soft-boned birds down the back. Remove the entrails and cut the bird in two pieces along the keel or breastbone (fig. 28).

(3) *Frying and stewing fowls*.—Cut into the familiar joints or parts when they are drawn (fig. 29).

The giblets and neck are cleaned, washed, drained, wrapped, and frozen in a separate package. Warm giblets should not be put in the body cavity for freezing because they spoil easily, especially if chilling is slow.

Pack the chilled pieces in compact packages, wrap carefully, and freeze promptly.

Game birds should be promptly scalded after killing, picked, cleaned, washed, and handled for freezing like other poultry.

Eggs

Only clean, strictly fresh eggs should be frozen. Discard cracked eggs and wipe all the dirty eggs with a damp cloth. Contamination from dirty shells may drop into the egg meats during the breaking process. In the preparation of eggs for freezing, cleanliness cannot be overstressed. The worker's hands should be thoroughly washed and only clean utensils used.



FIGURE 27.—Flexible canvas hammock helps to press the wrapping tight against the product and prevents slipping.



FIGURE 28.—Broiler chicken cut in halves for freezer storage.



FIGURE 29.—Unjointing dressed chicken for freezer storage.

Break each egg into a small dish to be sure it has no musty or stale odor before pouring it into a clean mixing bowl. For each cup of liquid whole eggs add 1 tablespoon corn sirup or sugar or 1 teaspoon of salt. Break all the yolks and mix the whites and yolks thoroughly. Do not stir so vigorously as to whip air into the eggs. The addition of sirup or sugar or salt and the thorough mixing decreases the thickness or gumminess of thawed eggs, making them more fluid. The choice of sweetening or salt depends on the way the eggs are to be used. One tablespoon of sugar does not make one cup of eggs very sweet. Eggs containing 1 teaspoon salt per cup can be used for custard. Commercial egg freezers mix the eggs so thoroughly with their special mixing equipment, that they find it unnecessary to add anything to the eggs to prevent gumminess. Where the mixing is done with ordinary kitchen utensils, the addition of sirup or sugar or salt has been found desirable.

Yolks and whites can be separated and frozen in separate containers. To decrease the thickness or gumminess of the thawed yolks add to each cup of yolks 2 tablespoons of corn sirup or sugar, or 1 teaspoon of salt before mixing. Two tablespoons of sugar will make one cup of yolks fairly sweet. Label the egg packages as to whether sugar or salt was added. Separated whites are packaged with nothing added and no mixing.

Liquid eggs are packaged in a moisture-vapor-proof container that holds just enough for about one meal or baking or one batch of salad dressing. Waxed paper cartons are suitable.

Butter

Creamery butter, made from pasteurized cream, is often packed in tubs or the familiar pound prints and stored at 0° F. for 6 months or longer. Home-made butter churned from unpasteurized sour cream would probably have an undesirable flavor after a few weeks in frozen storage. Butter made from sweet cream will keep better than that made from sour cream; it will keep still better if made from pasteurized sweet cream.

The home pasteurization of cream is suggested for making butter to be stored for more than a month.⁷ Packing it in brine is not necessary when the butter is to be stored at 0° F.

Sea Food

Freshness is indispensable to well flavored, wholesome sea food. Stale odors and flavors as well as spoilage develop rapidly when fish are removed from the water and held at warm temperatures. Chill or ice all sea food promptly. Never allow it to become warm.

All fish intended for freezing should be scaled, dressed, and washed. Large fish are then cut into steaks or boneless strips. Small fish are made ready the same as for cooking by removing the viscera, head, tail, and fins.

Frozen fish dry rapidly in freezer storage and must be carefully wrapped in vapor-resistant paper. Fish may also be glazed with

⁷See U. S. Dept. Agr. Farmers' Bul. 876, Making Butter on the Farm.

ice by being frozen without wrapping and then dipped one or more times in near-freezing water (fig. 30). This plain-water glaze is not permanent. It cracks or evaporates and may need renewal every 4 to 6 weeks. Further protection by wrapping the glazed, frozen fish in vapor-resistant paper is recommended.

Oysters, clams, and scallops are prepared as for cooking, washed in cold brine with a composition similar to sea water (3-percent salt solution or about $1\frac{1}{2}$ level teaspoonfuls of salt to a cup of water) and packaged in tight containers. See that the liquor completely covers the product to prevent discoloration during storage. Freeze promptly.

Hard shell crabs and lobsters are steamed while still alive and fresh. The edible meat is then picked out. Shrimp tails are separated from the body, peeled, cleaned and packaged without cooking. Crab, lobster and shrimp meat should be chilled before packaging, and frozen promptly. Shrimp tails may be packaged and covered with cold 3-percent brine before freezing to prevent drying.

Soft shell crabs are frozen individually while still alive and nested together for wrapping.

Further detailed information on freezing sea food may be obtained from the Fish and Wildlife Service of the U. S. Department of Interior, Washington, D. C.



FIGURE 30.—Fish glazed by dipping in water.

ESTIMATE OF EDIBLE AND NONEDIBLE PRODUCTS FROM HOME-DRESSED ANIMALS, POULTRY, AND EGGS

In planning the family's food budget it is desirable to know the percentage of edible product obtained from each kind of livestock, poultry, and eggs. The following tabulation shows the amount of trimmed meat cuts from home-dressed animals and poultry and amount of egg meats and shells from one case of eggs. These rounded meat yields will vary with the type and fatness of the animal, but the averages can be used as a guide.

BEEF

1 Beef: Live weight, 750 pounds; dressing percentage, 56; carcass weight, 420 pounds.

Trimmed Cuts

Whole carcass, 420 pounds:	<i>Percent of live weight</i>	<i>Percent of carcass weight</i>	<i>Pounds</i>
Steaks and oven roasts-----	23	40	172
Pot roasts -----	11	20	83
Stew and ground meat-----	11	20	83
Total trimmed cuts-----	45	80	338
			<i>Pounds</i>
Bone, trim, and fat (11 percent of 750 pounds) -----			82
Liver, heart, etc. -----			20

Hindquarters, 202 pounds:	<i>Percent of hindquarters</i>	<i>Pounds</i>
Steaks, oven roasts, and pot roasts-----	58	117
Stew and ground meat-----	18	37
Total -----	76	154
Forequarters, 218 pounds:	<i>Percent of forequarters</i>	<i>Pounds</i>
Steaks and oven roasts -----	25	55
Pot roasts -----	32	70
Stew and ground meat -----	27	59
Total -----	84	184

HOG

1 Hog: Live weight, 225 pounds; dressing percentage, 78; carcass weight, 176 pounds.

Trimmed Cuts

Whole carcass, 176 pounds:	<i>Percent of live weight</i>	<i>Percent of carcass weight</i>	<i>Pounds</i>
Fresh hams, shoulders, bacon, jowls for curing -----	40	50	90
Loins, ribs, sausage -----	15	20	34
Total trimmed cuts -----	55	70	124
			<i>Pounds</i>
Lard, rendered (12 percent of 225 lbs.) -----			27
Bones, etc., for head cheese (8 percent of 225 lbs.) -----			18
Liver, heart, and tongue -----			5

LAMB

1 Lamb: Live weight, 85 pounds; dressing percentage, 48; carcass weight 41 pounds.

Trimmed Cuts

Whole carcass, 41 pounds:	Percent of live weight	Percent of carcass weight	Pounds
Legs, chops, and shoulders-----	37	75	31
Breast and stew meat-----	8	15	7
Total trimmed cuts-----	45	90	38
			<i>Pounds</i>
Bone, trim, and fat (3 percent of 85 lbs.)-----			3
Liver, heart, and tongue-----			2

VEAL CALF

1 Veal calf: Live weight, 200 pounds; dressing percentage, 56; carcass weight, 112 pounds.

Trimmed Cuts

Whole carcass, 112 pounds:	Percent of live weight	Percent of carcass weight	Pounds
Cutlets and chops-----	17	30	34
Roasts-----	14	25	28
Stew and ground meat-----	14	25	28
Total trimmed cuts-----	45	80	90
			<i>Pounds</i>
Bone, trim, and fat (11 percent of 200 lbs.)-----			22
Liver, heart, tongue, and sweetbreads-----			10

POULTRY

Kind:	Live weight Pounds	Dressed and drawn Pounds	Percent of live weight
Young chickens-----	2 to 4	1¼ to 2½	62
Hens-----	4 to 8	2½ to 5½	65
Turkeys-----	10 to 20	7½ to 15	75

EGGS

Per case 30 dozen; 45 pounds net

Part:	Weight (pounds)	Percentage of whole eggs
Whites-----	20	46
Yolks-----	17	37
Shells-----	8	17
Total-----	45	100

PREPARING FRUITS AND VEGETABLES FOR FREEZER STORAGE

Fruits that can be frozen satisfactorily include apples, apricots, berries of all kinds, cherries, guavas, figs, mangoes, nectarines, peaches, pineapple, and some varieties of plums and prunes. Fruit juices, crushed fruit products, pulps and purees made from most of these fruits are very satisfactory for use in beverages, ices, and ice creams and for desserts.

Whole pears and grapes, especially the native types, and some plum varieties usually are not very satisfactory for freezing. They lose some of their characteristic appearance and texture.

Vegetables that can be frozen satisfactorily include asparagus, beets, broccoli, brussels sprouts, cabbage, carrots, cauliflower, green edible soybeans, lima beans, mushrooms, okra, peas—including edible-pod peas—snap beans (green or wax), sweet corn, sweet peppers, spinach, sweetpotatoes, and many greens.

Celery, cucumbers, leeks, lettuce, onions, and whole tomatoes for slicing have not been frozen satisfactorily, although tomato puree and tomatoes for cooking have been frozen with some degree of success.

Care should be taken in harvesting not to bruise, or otherwise injure fruits or vegetables to be frozen, especially the soft fruits.

Varieties Suitable for Freezing

Some varieties of fruits and vegetables retain their attractive color and firm yet tender plumpness, after thawing, to a greater extent than do others. This fact is of more importance to the commercial packer than to the locker patron but it is desirable for everyone to select the varieties that give the best results.

Local conditions of soil and climate also affect the freezing qualities of fruits and vegetables. Varieties that are suitable in some sections may be inferior to others when grown in another part of the country.

Harvesting dates and the behavior of the various varieties under local picking and freezing conditions are additional factors to be considered in selecting the best kinds and varieties of fruits and vegetables for freezer storage.

Lists of the varieties that have proved most successful in the area can be obtained from the county and home extension agents. Similar lists are put out by the commercial seed houses and are available in most of the locker plants. Desirable varietal characteristics are described in this circular.

Maturity and Quality

Do not waste locker space by filling it with produce that is not suitable in every way for immediate use. Fruits should be fully ripe but firm and free from hard green spots, decay, or other defects. Vegetables should be succulent, tender, with characteristic fresh taste and no signs of overmaturity, staleness, or spoilage.

The surest way to obtain high-quality produce is to pick it yourself or obtain it direct from field or garden. If food is purchased on the wholesale or retail market, be sure it is a good freezing variety and that it is freshly picked.

Handling Produce Before Freezing

Freeze all fruits and vegetables within a few hours after they are harvested if possible. The shorter the time between picking and freezing the better. Some products, like snap beans, withstand delays better than others, but peas and sweet corn lose

much of their sugar content within 3 to 6 hours and fully ripe fruit is the most perishable of all. If delays should occur in a locker plant, specific recommendations for holding each food are given in the section Directions for Preparing Specific Fruits and Vegetables for Freezing, page 42. Putting fruit in a 32° to 40° F. chill room or covering vegetables generously with cracked ice will slow down the loss of quality if delay is unavoidable. Chilling, however, is no substitute for prompt freezing.

Preparing Fruits for Freezing

Unnecessary handling of fruits, particularly raspberries and ripe peaches, should be avoided, but they must be sorted for spoilage and greenness and washed carefully. Be sure that low-growing crops like strawberries are freed from dirt or sand. Prepare the washed fruit as for the table.

The use of sugar or sugar sirup for packing fruits aids greatly in maintaining the color, texture, and aroma during and subsequent to defrosting. In fact all untreated cut fruits and strawberries will discolor and acquire an off-flavor very quickly after defrosting unless they are packed with sugar or submerged in sugar sirup. When a dry-sugar pack is used, the fruit must be mixed until each piece is coated with sugar. In apricots, peaches, and nectarines, the sugar must be dissolved before packaging to prevent darkening of the fruit. Boysenberries, youngberries, and raspberries are exceptions. These can be packed dry.

Corn sirup, both the regular and the high-conversion types, can be used in place of granulated sugar (sucrose) in packing fruit. Corn sirup is not as sweet as sugar. The regular type is rated as being about half as sweet and the high conversion type two-thirds. It will therefore be necessary to use a correspondingly larger amount of corn sirup in packing fruits to obtain the same degree of sweetness as sugar when this is desired.

Dry sugar draws some moisture from the fruit. This shrinkage is of no special importance if the fruit is to be cooked in pies or preserves before being used, and the sugar pack is less liquid than sirup. Sirup-packed fruits retain their normal size and shape more completely than those packed in dry sugar and have a more natural appearance when served as dessert.

Pretreatment of fruits for freezing.—Light-colored tree fruit has a tendency to turn dark when the flesh of the fruit is exposed to the air. This can be prevented by giving the fruit certain types of pretreatment before packaging.

Fruit, such as apples which are cooked before serving as in sauce or pies, can be scalded in boiling water or a light sirup prior to freezing to insure it against discoloration after defrosting. Apple slices should be dipped in the boiling water or a light sirup for from 1½ to 3 minutes, depending on thickness of slice. Cool, package, and freeze.

Steam scald, if available, may also be used for apples. Peel and slice the apples and drop the slices into a 1-percent salt brine

until enough are accumulated to scald. Place the slices in live steam for 2 or 3 minutes, depending on thickness of slice. Cool in air or in cold water. Slices that have not been sufficiently heated to inactivate the oxidative enzymes will darken in the center within a few minutes after cooling.

Apricots, nectarines, and peaches should be scalded for 30 seconds in boiling water and cooled in iced or running water for 30 seconds to remove skins. Peel, pit, and slice fruit. These fruits demand special attention, because they brown rapidly when exposed to the air. To prevent browning, the halves or slices may be treated with one of the following anti-darkening agents:

Citric acid: $\frac{1}{4}$ teaspoon citric acid to 1 quart of water. Allow slices to remain in this solution for 1 minute; then remove and package with dry sugar or sirup.

Sugar sirup (40 percent): $\frac{3}{4}$ cup sugar to 1 cup of water. Slice fruit directly into this sirup which can be used for packing.

Ascorbic acid: $\frac{1}{4}$ teaspoon ascorbic acid to 1 cup of 40-percent sugar sirup. Place slices in carton and cover with the sirup to which the ascorbic acid has been added. This treatment is very effective, but at the present time ascorbic acid is difficult to obtain and is expensive.

For packing with dry sugar a ratio of 3, 4, or 5 parts by weight of fruit plus 1 part of sugar is recommended. Mix sugar evenly through the fruit. The 4 plus 1 pack gives ample sugar protection and is not too sweet for most purposes. A 50-percent sirup is the all-around sirup, but a 40-percent sirup is satisfactory for some fruits. The 50-percent sirup is made accurately enough from equal quantities, by measure, of sugar and water. Dissolve the sugar by stirring rather than heating. Pour just enough cold sirup into the container to cover the well-packed fruit (fig. 31).

If scales are not available an estimate of the required sugar may be made on the following basis: Fruit very tightly packed weighs approximately as much as an equal volume of sugar (sucrose). Therefore, as an example, a 4 plus 1 pack for tightly packed fruit would be 4 cups of fruit to 1 cup of sugar.

Occasionally, a fondant sugarlike substance will be found on or in whole, sliced, crushed, or pureed fruits after they have been in storage for some time. This material often appears as white, or in the case of dark-colored fruits, tinted, glistening patches on the surface of the pack, resembling mold growths. Sometimes rather large masses are found extending through the contents of the package.

Much of this material, which is entirely harmless, is composed of very fine sugar (sucrose) crystals mingled with very small ice crystals. When the temperature and concentration of the juice of the pack gradually change in storage, dissolved sugar comes out of solution in the sirup or juice and is deposited in the crystalline form described.

Whole dry frozen strawberries and tree fruits, such as apricots,

freestone peaches, plums, and prunes, are not as satisfactory as when the fruit is sliced and frozen in dry sugar or in a sirup pack.

Sliced, crushed, and pureed fruit.—Crushed frozen fruit is an excellent flavor base for ice cream, sherbets, and beverages, for use in shortcakes and cobblers and as a sundae topping. These products make an excellent substitute for crushed fresh fruits. The natural flavor of these crushed or pureed frozen fruits is also somewhat more pronounced than that in sugar-packed halves or slices. The thorough mixing of the preserving sugar with the fruit fibers appears to be responsible for the stronger flavor.

Fruit can be crushed with a potato masher. An ordinary tinned sieve or a fruit press can be used for making skinless, seedless purees. Commercial equipment employing a conical screw expeller with a selection of screen sizes may also be available. Galvanized or copper screen should not be used. They may cause a metallic contamination of the fruit acids.

Combine 3 parts by weight, of sliced, crushed, or pureed fruit with 1 part of sugar and mix well. Do not beat air into the product. If it is packed in glass, care is needed not to fill the jar or bottle so full that the expanding, freezing liquid will break the narrowing shoulder or neck. Enamel- or lacquer-lined cans are resistant to the fruit acids that attack ordinary tin cans. A tight seal will prevent spilling before freezing as well as drying during storage. A hermetic seal is unnecessary.

In planning the quantities of sliced, crushed, or pureed fruit for use in frozen desserts, the following may serve as a guide: Twenty to thirty percent of an ice cream or sherbet mix is fruit; the juice can be used undiluted or as flavoring for a fruit punch. A few whole berries or peach slices add attractiveness when the crushed or pureed fruit is used for the main dessert or on a sundae.

Velva Fruit.—A frozen fruit dessert possessing the natural fresh flavor of fully ripened fruit and the smooth soft texture of ice cream can be made from fruit puree provided a stabilizer like gelatin is used. Sugar is added to the fruit puree in the ratio of 1 part of sugar to 3 parts of puree for most fruits. Some of the sweet fruits may require a smaller proportion of sugar.

Six cups of fruit puree and 2 cups of sugar are sufficient to make approximately 1 gallon of fruit dessert. It can be prepared as follows: Soften 2 tablespoons of granulated gelatin in $\frac{1}{2}$ cup of water and dissolve by heating to a temperature of 180° F. (10 minutes). To 6 cups of fruit puree add 2 cups of sugar, a dash of salt, and, if desired, 2 tablespoons of lemon juice. Add this mixture slowly to the dissolved gelatin, stirring constantly. Pour into an ice cream freezer. Using a proportion of 8 parts of ice to 1 part of salt, freeze until the mixture becomes firm and clings to the dasher. Harden it in the same way as for ice cream, either in a freezer or in a refrigerator. A smoother texture is obtained in a freezer than in a refrigerator since a temperature of approximately 0° F. can be obtained with a mix of 3 parts of ice to 1 part of salt.



FIGURE 31.—Packing strawberries: A, With sirup; B, with dry sugar.

Preparing Vegetables for Freezing

The fresh, succulent vegetables are carefully washed and prepared as for the table. That is, the peas or lima beans are shelled, the ends and strings are removed from snap beans, and the silk and tips removed from the ears of corn. The vegetables are then ready for the important process of blanching.

In frozen vegetables, the enzymes, normally present in all foods, will cause the development of off-flavors and unnatural colors unless they have been made inactive by a brief scalding or steaming. Blanching also brightens the color of many vegetables and softens them slightly so that such vegetables as spinach can be packed more easily and compactly.

Successful blanching depends on: (1) Heating each piece of product sufficiently to inactivate the enzymes, and (2) heating no particle so much as to give it a cooked quality.

Vegetables should be blanched in ample boiling water in small quantities, namely, 1 gallon of boiling water to 1 pound of vegetable (fig. 32). Put the relatively small quantity of prepared peas or beans or other vegetable into a wire basket or other porous container, large enough to allow the vegetable to separate and float or roll in the boiling water. Bring the water to a vigorous rolling boil each time before adding vegetables. With the proportion of 1 pound of product to 1 gallon of actively boiling water (212° F.), the temperature of the water should not drop below 200° when the vegetables are put in. Under these conditions, begin to count the scalding time as soon as the vegetables are placed in the water.



FIGURE 32.—Blanching vegetables in boiling water.

Blanching time, or the number of minutes vegetables should be held in the boiling water, varies from less than 1 minute for some small peas to as much as 11 minutes for corn on the cob. (See detailed instructions in the section Directions for Preparing Specific Fruits and Vegetables for Freezing, page 42, before blanching is begun.)

To prevent overcooking, blanched vegetables should be plunged into cold water as soon as they are removed from the scalding kettle—running water having a temperature of 50° to 60° F., or better, ice water. Don't oversoak, but use lots of water and chill the product as thoroughly as possible (fig. 33).

Blanching (scalding) with steam is used commercially and can be done in the home if steaming equipment is available, but it requires around twice as long a time as scalding with boiling



FIGURE 33.—Chilling blanched vegetables in running water.

water. Most authorities, however, do not recommend steam scalding for home use, because home steaming equipment is not as efficient as commercial.

The temperature at which water boils decreases with increasing altitude. Boiling water is not as hot in the mountains as at sea level and it will not blanch vegetables as quickly. The following tabulation gives the number of minutes that should be added to the sea-level blanching time for every 2,000 feet increase in altitude.

<i>Elevation above sea level (feet)</i>	<i>Blanching Time at Various Altitudes</i>	<i>Time added to specified blanching schedule (minutes)</i>
0-1,000	-----	None
Over 1,000 to 3,000	-----	$\frac{1}{4}$
Over 3,000 to 5,000	-----	$\frac{1}{2}$
Over 5,000 to 7,000	-----	$\frac{3}{4}$
Over 7,000 to 9,000	-----	1

To check the blanching process occasionally and see whether vegetables are sufficiently scalded, the peroxide test may be used. Crush a piece of the blanched product between two clean spoons or forks and put it into a clean tube or glass. Pour over it a few teaspoons of fresh 3-percent hydrogen peroxide. If a continuous stream of small bubbles rises, the enzymes are still active and blanching is incomplete. If no bubbles rise scalding may be considered sufficient. Test an unscalded sample first to check the peroxide used. This test is reliable for most vegetables, but it is not satisfactory for corn.

Drain the scalded, chilled vegetables and pack and freeze them promptly. Moisture-vapor-resistant containers are desirable to reduce drying during freezing storage. Most vegetables are packed dry, though covering the pack with a $1\frac{1}{2}$ to 2 percent salt brine ($\frac{1}{2}$ to 1 level teaspoon of salt per cup of water) protects against drying and delays total defrosting when the products are taken home. The amount of salt may be varied to suit individual taste. Fill the container to within 1 inch of the top with the vegetables and then barely cover the pack with cold brine. Defrost the brine pack before cooking to insure even heating. The mild, thawed brine contains some desirable food elements and should be saved and used.

Equipment Needed to Prepare Fruits and Vegetables for Freezing

1. Tables, a sink, and running water.
2. A set of household scales, if possible.
3. Suitable containers or packaging materials and a wide-mouthed funnel for filling packages.
4. Pans, stainless knives, cutting boards, measuring cups, large spoons, and ladles.
5. Paraffin, cold-storage tape, or other material for sealing containers; a flatiron or curling iron for heat sealing; tags or crayons for labeling; and a notebook for records.
6. For fruit: Colander or wire-screen sieve for washing fruit. Enamel, earthenware, or other noncorroding containers for washing and holding prepared fruit. Containers for mixing fruit with sugar or making sirup. Noncorroding screen sieve or special conical fruit sieve for pressing fruit into a smooth pulp or puree.
7. For vegetables: A good stove. Enamel or aluminum kettles with lids, for blanching; large kettles or a handy sink for cooling blanched vegetables; a fine-mesh wire or cheesecloth basket, with handles, for lowering the food into the blanching kettle and the cooling water; a screen or cloth drain for the cooled vegetables. A clock with a second hand to time the blanching period.

DIRECTIONS FOR PREPARING SPECIFIC FRUITS AND VEGETABLES FOR FREEZING

Apples

Desirable varietal characteristics.—Low browning tendency, firm greenish-white flesh, and distinctive flavor.

Harvesting.—Same procedures as for apples when used fresh. Fruit should be in firm-ripe stage and not overripe or mealy.

Handling.—Avoid delays at relatively high temperatures after picking. Apples picked in hard or firm stage, promptly stored at about 32° F., and not held in storage beyond usual storage life are best. Common air-storage apples are satisfactory if still firm ripe or ripe and not wilted.

Preparation.—Wash, peel, core, and section apples, trimming off bruised or wormy spots. Sliced fruit may be held in 1-percent salt brine or in a $\frac{1}{2}$ - to 1-percent solution of citric acid for short periods to control discoloration during packing.

Scald in boiling water for $1\frac{1}{2}$ to 2 minutes and allow to cool thoroughly in air before freezing. May be dipped in cold water for cooling, but losses of soluble materials such as sugar will increase with prolonged dipping.

Packing.—Dry-freeze on trays before packaging if a loose pack is desired; otherwise package before freezing.

Uses for Frozen Product.—Pie, cobbler, open-face cake, apple butter, sauce.

Apricots

Desirable varietal characteristics.—Low browning tendency, even ripening, distinctive yellow or orange color, rich and characteristic flavor, fairly firm texture, easily separated seed, tender and smooth skin.

Harvesting.—Proper maturity is very important. Best stage is firm, ripe, with fruit showing characteristic yellow color and practically no green, while fruit gives slightly when pressed with the thumb but is not soft or mushy.

Handling.—Prompt handling with a minimum of bruising or mechanical injury is essential since ripening proceeds rapidly at usual summer temperatures.

If delay is expected, keep in coolest place at hand, cool in cold or ice water, or hold at about 32° F. with a relative humidity of 85 percent, but do not keep longer than 10 days.

Preparation.—Sort, wash, halve, and pit. Sizing of halves in different containers is not necessary unless they show a wide variation. Peeling is not necessary, except for crushed or sliced fruit. To peel, scald for 15 to 30 seconds in boiling water and cool immediately; skin will then come off readily if fruit is ripe enough.

Coarsely crushed or sliced apricots, preferably peeled and with

sugar added in a 3-to-1 proportion and mixed thoroughly, make a good sundae topping.

Soft-ripe fruit pureed to a buttery consistency and packed in a 3-to-1 fruit-sugar proportion, thoroughly but carefully mixed without unduly stirring in air, makes a good flavor base for ice cream and sherbet.

Apricots darken quickly after peeling. They should be given an anti-darkening dip, if one is to be used, and packed covered with sirup or mixed with sugar immediately after halving.

Packing.—Preferable pack for apricots is with 40- to 50-percent sucrose sirup, using enough to cover the fruit. Sirup may well be chilled before it is used.

It is also possible to pack halved raw apricots mixed thoroughly with sugar (in a 5-to-1, 4-to-1, or 3-to-1 proportion). In cylindrical containers place a waxed-paper sheet over the surface to reduce oxidation, pressing the sheet down lightly in order that the sirup may coat it from below and improve the contact between fruit and the sheet.

Uses for frozen product.—Halves for pies, cobbler, fruit salad, or dessert; purees for sundae toppings, fruit ice cream, or Velvee Fruit.

Asparagus

Desirable varietal characteristics.—Green, well-colored, succulent stalks of moderate length with tissue free from woodiness or fiber.

Harvesting.—Harvest while heads are compact and tight and stalks are well colored.

Handling.—Handle quickly to prevent development of woodiness and loss of desirable flavor. If it is necessary to hold the asparagus longer than 3 to 4 hours after cutting, immediately cool to 32° to 40° F. by immersion in ice water, drain, and keep cool by covering with cracked ice or storing at 32° and 85 to 90 percent relative humidity.

Preparation.—Sort to remove deformed and insect-damaged stalks and divide into three size groups according to diameter—small, medium, and large. For tips, trim the stalks 4½ inches from the tip; for stalks trim 6 inches from the tip. Usually 1 to 2 inches of the more tender portion of the trimmings may be made into small cuts for use in soups. Thoroughly wash the trimmed tips, stalks, and cuts. Avoid the use of iron utensils. Scald in boiling water as follows: Small size, 1½ minutes; medium size, 2 minutes; large size, 3 minutes.

Cool in running water and drain.

Packing.—Asparagus can be frozen in containers with or without the addition of 1½-percent brine, as desired. Freeze as rapidly as possible in order to obtain a product that is not limp and tough when cooked.

Beans, Lima

Desirable varietal characteristics.—Green seed coat, high percentage of green-colored tender beans at harvesttime, uniform maturing habit, and easily opened pods.

Harvesting.—Harvest when the pods are well filled but still succulent. Pods past the succulent stage may contain a large proportion of overmature white beans.

Handling.—Handle quickly to prevent deterioration in quality, especially after the beans have been removed from the pod; do not permit more than 2 hours to elapse between shelling and the container. If longer holding is necessary, immediately cool the beans to 35° to 40° F. by immersion in ice water, drain, and cover with cracked ice or store in the refrigerator until ready for processing.

Preparation.—Sort the shelled beans to remove the imperfect specimens and to segregate the white overmature beans from the green tender ones. The former should be packed separately for soup stock. Wash the sorted beans in clean cold water. Scald in boiling water, the small-seeded types for 1½ minutes and the large-seeded types for 2½ minutes. Thoroughly cool in running tap water, and drain.

Packing.—Pack in containers with or without the addition of 1½-percent brine as desired.

Beans, Snap

Desirable varietal characteristics.—Bright green or yellow pods, tender, stringless, of medium size; should not split or slough skins during freezing or lose form and color during cooking.

Harvesting.—Harvest when comparatively immature, that is, before the seeds have developed to more than two-thirds of their normal size.

Handling.—The best results are obtained with prompt handling. If necessary, the beans may be held in a locker plant at 32° F. with an 85 to 90 percent relative humidity for a few days.

Preparation.—Sort out the dull-colored and wilted pods and those showing disease and insect damage. Snap and string if necessary. The beans may be packed whole or cut, as desired. Avoid the use of iron utensils.

Scald the prepared beans in boiling water for 1½ to 2 minutes. Promptly cool in running water and drain.

Packing.—The beans may be packed in the containers with or without the addition of 1½-percent brine under average conditions of home and refrigerated-locker freezing. Rapid freezing is essential for snap beans.

Beets

Desirable varietal characteristics.—Deep solid red color, without white rings; no woodiness; tender flesh, small size.

Harvesting.—Harvest when young and tender.

Handling.—Prompt handling is best for retention of nutritional value. If necessary, beets may be held at 31° to 32° F. with 85 to 90 percent relative humidity.

Preparation.—Cut off the tops and save to use as greens. Scald in boiling water for $\frac{1}{2}$ minute and cool in water quickly for easy peeling. Slice or dice into quarter-inch cubes and again scald in boiling water 2 to 3 minutes; cool in fresh cold water, and drain.

Packing.—Pack into containers and freeze without brine.

Blackberries

Desirable varietal characteristics.—Even ripening and resistance to bruising when fully ripe; lack of pronounced seediness or tough core; fleshy texture and rich flavor.

Harvesting.—Select plump berries that are fully black, with a velvet gloss rather than a shiny skin. The flavor should be sweet, and there should be no astringency. Discard rusty, reddish-colored, or poorly formed berries. Picking should be frequent so that berries of optimum maturity can be obtained.

Handling.—Handle carefully so as to avoid bruising or injury, which encourages mold growth, especially when temperatures are high. Pick in the morning, if possible, and hold in coolest place available. If delay in packing is anticipated, berries can be stored for 2 to 3 days in a locker plant at about 32° F. and 85 percent relative humidity.

Preparation.—Sorting, washing, and careful draining are essential. Blackberries intended for an ice-cream or beverage flavor base may be reduced to a seedless puree or juice, and sugar may be added in the proportion of 3 parts of fruit to 1 of sugar. The mixture should be thoroughly stirred without unduly beating in air. A mixture of coarsely crushed and whole fruit packed in a 3-to-1 fruit-sugar proportion makes a good sundae topping.

Packing.—Blackberries may be frozen on trays before packaging without sirup or sugar.

For dessert use, a sirup pack is preferable; use enough 40- or 50-percent sucrose sirup to cover the berries. For pie or jam, a sugar pack (in proportions of 5 to 1 or 4 to 1) is also feasible. Fruit packed with sugar only or with no sugar is not desirable for dessert purposes.

Uses for frozen product.—Whole berries for pies, cobbler, jam; crushed or pureed for flavor base and Velva Fruit.

Blueberries

Desirable varietal characteristics.—Tender skin, large size, sufficient acidity to give a sprightly flavor, and retention of natural bloom on surface.

Harvesting.—Follow usual practices employed for harvesting blueberries for fresh use, picking when the maximum number of berries are fully formed and colored.

Handling.—Because of their relatively slow ripening, the handling of blueberries is not difficult. A short delay requires no special precautions, provided berries are kept reasonably cool. If a longer delay is unavoidable, blueberries may be held at about 32° F. with an 85 percent relative humidity.

Preparation.—Berries should be well screened or sorted, washed, and drained. Screening should remove all immature and very small fruit as well as leaves and foreign matter.

If the berries are to be used as a sundae topping, at least part of them should be coarsely crushed and sugar added in 3-to-1 fruit-sugar mix.

Packing.—Blueberries intended for use in pies may be frozen with sirup or sugar. If berries are to be used for fresh dessert, a 40- to 45-percent sucrose sirup is desirable.

Uses for frozen product.—Pies; cobbler; in coarsely crushed form, for sauce or sundae topping.

Boysenberries

See dewberries.

Broccoli

Desirable varietal characteristics.—Dark-green color, tenderness and absence of stringiness in stalks, compact heads, and uniform maturity at harvest.

Harvesting.—Harvest before the bud clusters or heads open to the extent that the full yellow or purple color of the blossoms is distinct.

Handling.—Do not pack so tightly that adequate ventilation is impossible and stalks become ragged or torn. Best results are obtained with prompt handling. If more than ordinary delays are encountered, broccoli may be laid loosely in open crates and held in the locker plant at 32° F. with an 85 to 90 percent relative humidity for a few days.

Preparation.—Discard wilted and flabby broccoli. Sort very carefully to eliminate wormy stalks. Trim off the very large leaves. Woody stem ends should be cut off. Wash thoroughly and separate into small, medium, and large stalks. It is desirable to split very large stalks lengthwise with a knife.

Scald in boiling water: small stalks for 3 minutes; medium stalks, 3½ minutes; large stalks, 4 minutes. Cool promptly in water, and drain.

Packing.—Pack into containers, with or without 1½-percent brine as desired.

Brussels Sprouts

Desirable varietal characteristics.—Firm, compact, moderately large sprouts of bright appearance and deep-green color.

Harvesting.—The usual harvesting practices for fresh market uses are satisfactory.

Handling.—Handle promptly. If necessary, the sprouts can be held for several days at 32° F. with 90 to 95 percent relative humidity.

Preparation.—Discard wilted, discolored, infested or diseased sprouts. Wash thoroughly, and if the sprouts appear to be badly infested with worms and aphids soak in lukewarm 1.5-percent salt solution for 15 to 20 minutes. The salt solution may be prepared as described under the general directions for packing.

Sort into two groups, separating firm, compact sprouts from loose sprouts. The latter, though edible, are generally poor in quality and should be packed separately for use in soups. Divide the sorted sprouts into small, medium, and large sizes. Scald each size in boiling water as follows: Small size, 3 minutes; medium size, 4 minutes; large size, 5 minutes.

Cool in cold water, and drain.

Packing.—Pack into the containers with or without 1½-percent brine, as desired.

Cabbage

Desirable varietal characteristics.—Solid and compact heads, green and white color, succulence and crispness of leaves, and absence of fibrous midrib.

Harvesting.—The usual harvesting practice for fresh market use is adequate.

Handling.—Best results are obtained by prompt handling, but if delays are unavoidable, storage at 32° to 35° F. with 90 to 95 percent relative humidity is satisfactory.

Preparation.—Discard the outside leaves and any that are wormy, defective, or discolored. Cut the head into convenient sizes or the larger leaves may be packed separately if desired.

Scald the cut sections of the head for 3 to 4 minutes in boiling water, depending on their size. Scald separate leaves for 1½ minutes. Cool in fresh cold water.

Packing.—Cabbage may be packed with or without the addition of 1½-percent brine, as desired.

Cantaloup

(also Persian and similar melons)

Desirable varietal characteristics.—Attractive flesh color, lack of browning tendency, thick flesh (to permit dicing or cutting fruit in balls for fruit cocktail), and distinctive flavor.

Harvesting.—Melons fully matured on the vines are most desirable. Characteristic ripe cantaloup or melon odor, ease of removal from stem, and ripe appearance of skin and skin netting indicate suitable ripeness. Flesh should be somewhat firm but fully ripe.

Handling.—Packing should not be long delayed if melons or cantaloups are fully ripe. Molding becomes a problem when

juice leaks from ripe fruit. If a longer delay is unavoidable, cantaloups may be held for a few days at about 32° F. with 85 to 90 percent relative humidity.

Preparation.—After peeling and removing seeds, cut in slices, dice, or cut in balls. The flesh may be coarsely crushed by passing it through a food chopper, using a coarse cutting knife. Crushed material should be thoroughly mixed with sugar in a 4-to-1 or 3-to-1 proportion.

Packing.—The balls or slices may be frozen without sugar or sirup by layering them between waxed paper so as to permit their easy separation for use without complete thawing.

Uses for frozen product.—In fruit cocktails, either in balls or diced; if coarsely crushed, mixed with ginger ale. When served, pieces or pulp should be only partly defrosted. Excellent for Velvee Fruit.

Carrots

Desirable varietal characteristics.—Bright orange color, absence of fibrous core, tender texture, and sweet flavor.

Harvesting.—Harvesting is the same as for the fresh market.

Handling.—If necessary, carrots may be held a short time at 32° F. with a 90 to 95 percent relative humidity. Wilting is caused by too-long and too-dry storage. Best results are obtained with freshly harvested material.

Preparation.—Cut off the tops, and discard wilted, flabby, soft, or shriveled carrots. Scrub with a stiff brush under cold running water, trim, and dice into 1/4-inch cubes. Do not attempt to freeze whole carrots unless they are very small, tender, and young. Scald the diced carrots in boiling water for 2½ minutes. Cool in fresh cold water, and drain.

Packing.—Pack into the containers with or without 1½ percent salt solution, as desired.

Cauliflower

Desirable varietal characteristics.—White curd, compact head with relatively smooth surface, tender texture, absence of riciness, and not too thick flowerlet stalks.

Harvesting.—The usual harvesting procedure is satisfactory.

Handling.—Handle promptly and avoid bruising the curd.

Preparation.—Break up the curd into medium-sized pieces not over 1 inch thick and wash. Tender stem pieces may be included. Scald in boiling water 2½ to 3½ minutes. Cool in fresh cold water, and drain.

Packing.—Pack into containers with or without 1½ percent salt solution, as desired.

Cherries, Sour

Desirable varietal characteristics.—Uniform bright-red color,

even maturing on the tree, low browning tendency, sprightly acid flavor, fairly firm texture, and tender skin.

Harvesting.—Harvest at full maturity, while color is bright red; overripe cherries are usually too dark and soft, while immature cherries are too pale, lack distinctive flavor, and show handling bruises readily.

Handling.—Careful handling of fruit after harvest is essential because bruises and injuries quickly cause molding at high temperatures. Picking baskets or boxes should not be filled so full that cherries at the bottom are crushed, and picked cherries should not be jolted when being carried.

Delays in handling should be shortened as much as possible, and cherries should be kept cool. If a delay is unavoidable, prompt delivery of the fruit to cold storage at about 32° F. with 85 percent relative humidity will allow a maximum holding period of not over 1 week. Cherries rapidly lose flavor and deteriorate when held long after harvest.

Preparation.—After being sorted, washed, and drained, cherries are generally pitted before being packed. Soaking in water before pitting should not be prolonged but may make pitting easier.

Coarsely crushed, pitted sour cherries packed with sugar in a 2-to-1 or 3-to-1 fruit-to-sugar proportion are satisfactory as a flavor base for ice cream.

Sour cherry juice with sugar added (in proportions of 2 to 1 or 3 to 1) makes a good beverage flavor base.

Packing.—For pies, a pack of 5-to-1, 4-to-1, or 3-to-1 fruit-to-sugar proportion is satisfactory. The sugar should be well mixed with the fruit.

Un sugared pitted sour cherries tend to discolor rapidly during freezing and defrosting.

Uses for frozen product.—For pie and cobbler use whole pitted cherries; use coarse-crushed for ice-cream flavor base; use juice for sherbet, punch, or beverage.

Cherries, Sweet

Desirable varietal characteristics.—Low browning tendency, large size, firm texture after freezing and thawing, uniform maturity, tender skin, and rich flavor, with uniform color in dark types, red blush in light types.

Harvesting.—Proper maturity is essential. Fully tree-ripened cherries, picked when firm and with a “snap” in the skin, have the best flavor and suffer the least softening during freezing. Cherries should be picked riper than is usually customary for fresh use.

Cherries that are very soft when fully ripe are not satisfactory except for crushed or pulped product.

Handling.—Desirable procedure is the same as for sour cherries.

Preparation.—Customary stemming,^{*} sorting, washing, and draining are required. Pitting is not absolutely necessary for

whole fruit, although pits tend to give an almondlike flavor, which may not be desirable.

Coarsely crushed, pitted sweet cherries with a distinctive flavor make a good sundae topping when packed with sugar in a 3-to-1 fruit-to-sugar proportion. Cherry juice in a 3-to-1 mix may be used as a beverage. The crushed product or the juice must be prepared and frozen with a minimum of delay in order to avoid discoloration and flavor change.

Packing.—For dessert use, pack whole cherries with 40- or 50-percent sucrose sirup. Sweet cherries packed without sugar, unless very ripe, are not generally satisfactory.

Uses for frozen product.—Whole, pitted cherries for pies, cobbler, and dessert. Crushed cherries for sundae topping, and juice for beverage base.

Corn, Sweet, Whole-Cut

Desirable varietal characteristics.—For yellow or orange corn, a distinctive, brightly colored kernel, tenderness of texture and kernel epidermis, uniform maturity, and deep kernels. For white corn, the same characteristics are desirable except that the color of course should be white.

Harvesting.—Harvest when the kernels are full-rounded or slightly appressed, highly colored, with a rich milky juice when pressed, and sweet in flavor.

Handling.—Prompt handling is necessary. For corn to be processed in a locker plant pack ears loosely to prevent self-heating. If delays in handling are unavoidable, rapidly cool the ears to 35° to 40° F. by immersing in ice water, drain, and hold at a low temperature by keeping the cooled ears covered with cracked ice or placing them in a cooler at 30° to 32° F. with 85 to 90 percent relative humidity.

Preparation.—Silk and trim the ears as for using fresh. Scald the ears in boiling water for 2 minutes and cool in fresh cold water. After this treatment, cut the corn off the cob with a sharp knife. Rinse the cut corn quickly in cold water, skimming off any chaff that rises to the surface. This treatment should be as short as possible and may be omitted if the cut corn is free from shreds of chaff.

Packing.—Pack in containers without salt solution.

Corn, on Cob

Desirable varietal characteristics.—Same as for whole-cut corn.

Harvesting.—Same as for whole-cut corn.

Handling.—Same as for whole-cut corn.

Preparation.—Silk and trim as for fresh use. Cut the ears into approximately 3-inch lengths to facilitate scalding. The ear should also be divided into small-, medium-, and large-diameter sizes.

Scald in boiling water as follows: Small-diameter, 7 minutes; medium, 9 minutes; large, 11 minutes.

Cool in fresh water and drain. Do not let stand in the cooling water longer than necessary. Corn absorbs water readily after scalding and becomes soggy. Cooling in air with a fan blowing over the material has been tried where summer-air humidities are low. In this way the amount of time for water cooling can be reduced but the material usually still requires cooling in water since air temperatures are usually relatively high.

Packing.—Wrap each ear in moisture-vapor-proof paper and twist the ends. The wrapped ears may then be frozen separately on trays or placed in paper bags or a small shipping carton for freezing, but there should not be over 2 dozen ears in one container. Ears frozen on trays may be put into shipping cartons or large cans for storage.

Cranberries

Desirable varietal characteristics.—Deep-red, uniform color; tender, glossy skin; sprightly acid flavor; absence of mealiness in texture.

Harvesting.—Customary procedure used for harvesting cranberries for fresh use is satisfactory.

Handling.—Because they ripen relatively slowly, cranberries are not difficult to handle. If long delays before packing are expected, storage at 32° F. with 85 percent relative humidity might be desirable. Usually cool storage is sufficient.

Preparation.—Customary sorting and screening, with elimination of poorly formed or soft berries, stems, and debris, and thorough washing are usually necessary.

Packing.—Cranberries are frozen whole without sugar or sirup. The pureed fruit is packed with an equal part of sugar for quick freezing.

Uses for frozen product.—For making sauce or in crushed form as a frozen side dish.

Dewberries, Including Loganberries, Boysenberries, Youngberries, and Similar Types

Desirable varietal characteristics.—In dewberries, rich purple color, distinctive flavor, soft texture and berry center (torus) and skin resistant to bruising. In loganberries, the color should be deep red and the flavor tart.

Harvesting.—Full maturity is important; the fine quality of dewberry types is not developed in immature berries, and loganberries are sour and unpalatable until ripe. Requirements, except as to color, are similar to those for blackberries.

Handling, preparation, packing, and uses.—Follow directions for blackberries.

Figs

Desirable varietal characteristics.—Rich flavor and aroma, tender flesh and skin, dark color well retained, seeds not easily noticeable, and freedom from internal rots or tendency to sour.

Harvesting.—Figs to be frozen should be riper than for fresh shipments; harvest at stage when entire fig is soft but before it begins to shrivel. Only small portion of stem should be green. Figs sorted out as being too ripe for shipment are usually about right for freezing.

Handling.—Figs are very perishable, developing mold in a day or two at usual summer temperatures; freeze fruit within a day after picking. If necessary to delay several days, hold at 31° to 32° F. with 80 to 85 percent relative humidity.

Preparation.—Carefully wash and sort, culling all figs that show internal rots or souring. Cut off stems to fleshy portion of fig. Peeling, halving, and slicing may be done, but whole unpeeled fruit presents most attractive appearance. Halving figs permits easy detection of internal rots, but with Black Mission such spoilage is not as much of a factor as with Calimyrnas. Discoloration causes little trouble, but figs should be frozen soon after being put into containers.

Packing.—Packed preferably in 35-percent sugar sirup. A concentration of only 20-percent sugar results in loss of flavor, while higher concentrations, up to 50 percent, result in some shriveling and are too sweet. Packing without sirup or with dry sugar is not recommended as either results in loss of flavor and a tendency to discolor during and subsequent to defrosting.

Uses for frozen product.—Dessert and preserves.

Gooseberries

Gooseberries may be frozen by methods employed for cranberries. The gooseberries should be fully ripe when harvested, as for use when fresh.

Grapes

Desirable varietal characteristics.—Vinifera types; even maturity, tender skin, sweet delicate flavor, relative freedom from seediness, and resistance to discoloration; native types not usually suited to freezing except for subsequent juice pressing.

Harvesting.—Only fruit which has developed full flavor on vine should be used, but raisining should not have started.

Handling.—Grapes generally can be handled without too much bruising or rapid deterioration, but they should be handled before there is material shrinkage due to evaporation. Cool storage desirable if packing is delayed. If delay is very long, holding at about 32° F. with 85 percent relative humidity is desirable.

Preparation.—Washing, sorting, and elimination of scarred and undersized grapes are essential. Since grapes are seeded and skinned with difficulty, packing whole is recommended.

Packing.—Pack preferably with a 35- to 40-percent sugar sirup for vinifera types. Too high sugar concentration destroys characteristic flavor and may cause shriveling. Keeping grapes covered with sirup is essential; reduction of head space of containers to bare minimum required will be helpful. Freezing grapes without sirup or sugar is not recommended except for native types for juice pressing.

Uses for frozen product.—Pie, dessert, juice, and preserves.

Huckleberries

See blueberries.

Loganberries

See dewberries.

Mushrooms

Desirable varietal characteristics.—Tender flesh, little tendency to discolor, and an agreeable flavor.

Harvesting.—Harvest as for fresh market. Button sizes are better than larger sizes which require slicing.

Handling.—Handle carefully to avoid bruising, discoloration, and deterioration. If necessary mushrooms may be held a few days at 31° to 32° F. with 85 percent relative humidity.

Preparation.—Remove defective pieces. Sort into button and larger sizes or pieces and carefully wash in cold water. Scald in boiling water as follows: Button sizes and smaller, 2 minutes; larger sizes, 3 to 4 minutes.

Cool in fresh cold water, and drain.

Packing.—Pack into container with or without 1½-percent salt solution, as desired. Packing in salt solution is preferable.

Nectarines

Nectarines are essentially smooth skinned freestone peaches and hence can be treated in much the same manner as freestone peaches.

Desirable varietal characteristics.—Low browning tendency, characteristic pronounced flavor, slightly blushed skin, and smooth firm texture free from fiber.

Harvesting.—Proper maturity is highly essential to retention of characteristically delicate flavor. Best time seems about the “eating ripe” stage, not soft ripe, when flesh gives to pressure of thumb with some firmness but is not soft and mushy.

Handling.—Fruit ripens rapidly at usual air temperatures prevailing at harvest, hence should be frozen soon after picking. If necessary, however, it may be held a few days at about 32° F. with 85 percent relative humidity. Discoloration at the seed and loss of flavor occurs if such storage is prolonged.

Preparation.—Usual sorting, washing, draining, halving, and pitting as for apricots.

For crushed fruit, nectarines may be peeled, but it is not necessary. After peeling, the fruit should be submerged at once in water or preferably weak citric acid solution ($\frac{1}{2}$ - to 1-percent) to prevent discoloration.

Halves or slices should be covered promptly with sirup for the same reason.

Pureed nectarine of buttery consistency may be mixed thoroughly and promptly with sugar (3 parts of fruit to 1 of sugar) to make a fruit flavor base. Coarsely crushed yellow-fleshed nectarines with sugar added make good sundae topping.

Packing.—Pack preferably in a 40-percent sugar sirup; 35-percent sugar may be satisfactory for the very sweet varieties. Sirup may well be chilled before adding fruit. Packing without sirup or with dry sugar is not recommended. Exclusion of air from surface of fruit is desirable as with apricots. Puree with sugar in a proportion of 3 to 1, taking care not to beat air into the puree while stirring to thoroughly mix the sugar. Pack coarse crushed and sliced fruit for sundae topping with sugar in the same proportion thoroughly mixed.

Uses for frozen product.—Halves or slices in sirup for dessert. Coarsely crushed fruit mixed with slices is excellent for sundae topping and cobbler. The puree makes an excellent ice-cream, sherbet, or milk-shake flavor base.

Olives, Ripe

Desirable varietal characteristics.—The cured ripe olives, selected for freezing, should be tender skinned and with the most desirable flesh texture and rich flavor.

Harvesting.—Customary procedures as for olives intended for curing.

Handling.—Usual sorting, sizing, and curing operations.

Preparation.—It is usually best to wash the storing or shipping brine from cured ripe olives and replace with fresh 2-percent brine in packing if liquid is desired. Scalding is unnecessary for olives. It has been suggested that toughness of skin in frozen ripe olives might be prevented by precooking the olives. This does not seem necessary, if proper selection of olives is made, especially since some loss of flavor would result from the pre-cooking. If the olives are already graded, no further inspection is required, and they are very easily prepared for freezing.

Packing.—May be packed either dry or in 2-percent brine as preferred, although flavor and texture are somewhat better when brine is used.

Uses for frozen product.—Relish or side dish.

Peaches, Clingstone

Desirable varietal characteristics.—Low browning tendency, uniform maturity, fine-grained rich yellow or orange-colored flesh.

Harvesting.—Picking at full maturity is essential for good flavor and high quality.

Handling.—Clingstone peaches are not as easily crushed as freestones, but those picked at prime maturity will not tolerate the rough handling that many picked for canning receive. A somewhat longer delay is permissible than for freestones, but if it extends beyond a day or two temperatures of about 32° F. are desirable with an 85 percent relative humidity. Storage should not extend beyond a 15-day limit.

Preparation.—Sorting, peeling, pitting, and slicing are required. The fruit is easily peeled with hot (180° F. to boiling) 2- to 5-percent lye for 45 seconds to 1½ minutes. As soon as the skin appears to have loosened, the peaches should be removed to clean cold water and the skin rubbed off with the hands until the flesh is smooth. The fruit should be thoroughly rinsed, preferably in cold running water. The pit is then removed with a pitting spoon and the halves sliced.

Packing.—The slices can be packed and frozen without sugar or sirup.

Uses of frozen product.—Pies, cooked sauce, or cobbler.

Peaches, Freestone

Desirable varietal characteristics.—Low browning tendency, uniform maturity, firm fine-grained rich-yellow or orange-colored flesh, freestone and easily peeled skin. Peaches with a red color about the pit cavity make an attractive uncooked dessert.

Harvesting.—Picking at proper maturity is essential to high quality. Firm ripe stage most desirable, when skin has lost most or all of its greenish color and the flesh yields slightly under pressure of the thumb. Fruit in soft ripe stage is unsatisfactory for halving or slicing, but may be used for puree.

Handling.—Bruising must be reduced to a minimum and picked fruit should be kept as cool as possible. If there is some delay before packing, cool in cold or ice water. For longer storage, temperatures about 32° F. are desirable with an 85 percent relative humidity, but storage should not be longer than 10 days. Discoloration at the seed, mealiness, and loss of flavor result from prolonged storage.

Preparation.—Sorting, peeling, halving, and pitting are required. Ripe fruit is easily peeled after the skin is loosened by 15 to 30 seconds in boiling water. Peaches may be packed as halves, sliced, or pulped. If halved or sliced the fruit should be covered promptly with sirup in order to reduce discoloration. Peaches behave similarly to apricots and nectarines.

A mixture of coarsely crushed and sliced peaches in a well-mixed 3-to-1 sugar pack makes an excellent sundae topping. Smoothly pureed peach pulp is well mixed with sugar in a 3-to-1 fruit-to-sugar proportion for flavor base. The pulp and puree must be stirred or aerated as little as possible because of browning tendencies in many peach varieties.

Packing.—Cover the fruit halves or slices promptly with 40- to 50-percent sucrose sirup, which may well be chilled before being added to the fruit.

Packing halves or slices without sugar is not desirable. Dry sugar may be used in place of sirup but is usually not so satisfactory. Exclusion of air from surface of fruit is desirable.

Uses for frozen product.—Halves and slices for pies, cobbler, and fresh dessert; crushed and pureed fruit for sundae topping and flavor base. A puree very rapidly frozen to produce a smooth texture makes a pleasing frozen dessert.

Peas

Desirable varietal characteristics.—High productivity, brilliant green color when scalded, uniform size, tenderness and sweetness at optimum maturity, and easily podded. The green-skinned, wrinkle-seeded varieties are best for freezing preservation. In general, avoid the use of varieties commonly used in commercial canning, except the Thomas Laxton types which can be frozen or canned. Perfection and Surprise are two canning types that are now sometimes frozen for institutional or Army use. For use with soups or stews these types would be satisfactory if harvested at a somewhat earlier stage of maturity than is customary for canning.

Harvesting.—Harvest before the peas become overripe. Best results are obtained by harvesting when pods are well filled but not tightly filled and are bright, green, crisp, and succulent.

Handling.—Unshelled peas should not be held longer than 6 to 8 hours at ordinary atmospheric temperatures but may be stored for several days at 32° F. with 85 to 90 percent relative humidity, provided they are not stored in large masses.

In the home shelled peas should be processed at once. If this is not possible, rapidly cool the shelled peas to 35° or 40° F. by immersion in ice water, then drain, and keep covered with cracked ice during the holding period, not to exceed 24 hours; or store in the locker plant at 32° F. with 85 to 90 percent relative humidity.

Preparation.—After shelling, sort out the overlarge, hard, starchy peas, splits, skins, and debris. Wash the sorted material in clean water. Scald in boiling water for 1 minute, rapidly cool in fresh cool water, and drain.

Packing.—Pack in the containers with or without 1½-percent salt solution, as desired.

Peppers (Green and Pimiento)

Desirable varietal characteristics.—Uniform deep green or red color, glossy skin, thick flesh, tender texture, and high characteristic flavor.

Harvesting.—The customary harvesting practices for peppers intended for fresh use are satisfactory.

Handling.—If the material cannot be processed immediately after harvest, it may be satisfactorily held at 32° F. with 85 to 90 percent relative humidity for as long as a few weeks.

Preparation.—Wash and cut into halves, quarters, or slices, removing the seeds. It is not necessary to scald peppers, but the resilience of the tissue will be reduced by scalding, which makes packing into containers easier. If scalding is resorted to, leave in boiling water or steam for 2 minutes, promptly cool in water, and drain.

Packing.—Peppers are best when frozen in enough 1½-percent salt solution to cover the product.

Persimmons

Desirable varietal characteristics.—Tender flesh, even ripening, rich flavor, and absence of strong astringent taste, golden or orange color, and tender skin.

Harvesting.—Since persimmons are used primarily for puree or pulp, the most desirable stage is soft ripe, without discoloration or mushiness.

Handling.—Soft-ripe fruit must be handled promptly and is not suitable for storage.

Preparation.—After sorting, washing, and cutting up, pulping is easily done. It may be desirable to peel before pulping to avoid hard fragments of skin. Poorly formed or skin-discolored fruits may be used if quality is good.

Packing.—Puree or pulp is packed with sugar (5 to 1 or 4 to 1) thoroughly mixed.

Uses for frozen product.—As a flavor base for ice cream or sherbet, or as frozen dessert when rapidly frozen to a smooth texture.

Prunes and Plums

Desirable varietal characteristics.—Uniform ripening, low browning tendency, fairly firm flesh, tender skin, lack of tendency in flesh to discolor at seed, rich flavor, and deep color.

Harvest.—Proper maturity is essential to quality. Prunes should be fully tree-ripened before harvest but not discolored at the seed. Bronze or reddish prunes are not desirable. Plums are usually best used for pulp or puree; hence full tree ripeness is essential and reasonable softness not undesirable.

Handling.—Prunes are usually quite easy to handle and are resistant to bruising. Plums are more easily bruised and injured, especially if soft ripe, and there may be molding at summer temperatures. Keep as cool as possible. Cold storage is usually not necessary for prunes and not desirable for soft-ripe plums. Prunes harvested at optimum maturity may be held at about 32° F. with 85 percent relative humidity for not longer than 2 weeks. Internal browning, wilting, and abnormal flavor may develop in long-stored prunes.

Preparation.—Usual sorting, washing, halving, and pitting are required. Peeling is not necessary.

Purees are prepared with a 4-to-1 or 3-to-1 sugar pack, thoroughly and promptly mixed in order to diminish discoloration.

Packing.—Prune halves may be packed preferably with 40- to 50-percent sucrose sirup to cover, or they may be coated with sugar, although the texture and color of the product is usually not so good.

Uses for frozen product.—Halves for pies, cobblers, open-face cake, sauce dessert; juice and puree for sherbet flavor base.

Pumpkin

See squash.

Raspberries, Black

Desirable varietal characteristics.—Minimum seediness, plumpness of berry, and juiciness of flesh, deep dark color, and large size.

Harvest.—Fruit should be harvested at the full-ripe stage before the berries begin to shrivel.

Handling.—Although not as perishable, black raspberries cannot be held for much longer periods than red or purple raspberries. Holding in a cool place after picking is desirable. Longer storage is possible at about 32° F. with 85 percent relative humidity, but the period should not exceed a few days.

Preparation.—Careful sorting and screening is desirable so that poorly formed, sunburned, or immature and small berries as well as stems and leaves may be eliminated. Washing may be desirable but is not always necessary. Drainage should be thorough.

Black raspberries are often reduced to seedless puree.

Packing.—Whole berries are not usually packed with sirup because they are too seedy for dessert use. If sucrose sirup is used, 40- to 50-percent concentration is satisfactory.

Dry frozen berries may be prepared for subsequent juice, jam, or jelly preparation.

Purees are prepared with sugar in a 3-to-1 fruit-sugar mix.

Uses for frozen product.—Dessert, flavor base, juice, jelly, or jam or Velva Fruit.

Raspberries, Red, Purple, or Yellow

Desirable varietal characteristics.—Deep red or purple or bright orange-yellow color; absence of seediness; rich flavor, mild or sprightly acid; resistance to bruising, crumbling, or collapse.

Harvest.—Very careful attention to maturity is essential to high quality. Firm-ripe, bright-red raspberries are best; over-ripe fruit is usually too dark in color for use as whole fruit but may be used for seedless puree.

Picking should be frequent and thorough to avoid overripe or moldy berries. Raspberries picked after rainy or exceptionally warm weather may be inferior or moldy.

Handling.—Very rapid ripening of the raspberry demands the utmost speed and care in handling. Pick in the morning, prefer-

ably, and keep in the coolest place available. Storage for more than a few days at about 32° F. with 85-percent relative humidity is not desirable; any delay in packing and freezing should be very short.

Raspberries bruise and injure readily and must be handled with more care than other berries. Picking baskets and boxes should be shallow-filled and all jolting of the picked fruit avoided.

Preparation.—Sorting is desirable, but washing may not be necessary. If washed, raspberries should be thoroughly drained.

Seedless puree may be prepared by the method described on page 37.

Packing.—Whole berries may be packed with 40- to 50-percent sucrose sirup for dessert use, with sugar in various proportions (5 to 1, 4 to 1 or 3 to 1), or without sugar, in which case they may be frozen loose on trays before packaging.

Uses for frozen product.—Dessert, cobbler, pies, preserves, jam, and the purees for flavor base, sundae topping, or Velva Fruit.

Rhubarb

Desirable varietal characteristics.—Deep-red skin, tender stalks, absence of fiber, sprightly acid taste.

Harvesting.—Harvest as customary for fresh use.

Handling.—Prompt preparation and freezing are best, but if necessary rhubarb may be held 2 to 3 weeks at 32° F. with 90 to 95 percent relative humidity.

Preparation.—Thoroughly wash, trim, and cut into 1-inch pieces. Scald in boiling water 1½ minutes, cool in cold water, and drain.

Packing.—Pack into containers without the addition of sugar sirup or dry sugar.

Uses for frozen product.—Pie and sauce.

Soybeans, Green Edible

Desirable varietal characteristics.—All-green seed coat, uniform maturing habit, and easily opened pods.

Harvesting.—Harvest when the pods are well filled but before they begin to lose their bright green color.

Handling.—Same as for lima beans.

Preparation.—Removal of the beans from the pods will be facilitated by scalding the pods in boiling water for 5 minutes followed by prompt cooling in cold water. The beans are then readily squeezed out of the pods. No further scalding is required. The shelled beans are then washed and drained.

Packing.—Pack into containers, with or without salt solution as desired.

Spinach

Desirable varietal characteristics.—Deep-green color, minimum amount of woody or fibrous midrib, succulent leaves, and high flavor.

Harvesting.—Harvest before flowering begins or before the leaves become tough.

Handling.—Prompt processing is best. If this cannot be done, the spinach should be cooled to 35° or 40° F. by immersion in ice water. The spinach cooled in this manner should be drained and then kept covered with cracked ice during the holding period, or the cooled material may be held at 32° F. with 90 to 95 percent relative humidity.

Preparation.—Thoroughly wash, and remove diseased or insect-infested leaves. Trim as for fresh use, removing the larger tough stems. Scald in boiling water for 1½ minutes. Prompt and thorough cooling in fresh cold water is very essential. Allow to drain thoroughly before packing.

Packing.—Pack into containers without salt solution.

Strawberries

Desirable varietal characteristics.—Bright-red color, lustrous skin, resistance to bruising, firm fine-grained flesh, red center, light-colored seeds, not too numerous, distinctively and sprightly acid flavor.

Harvest.—Full red color is essential to high quality and is a good indication of proper maturity. Fruit may be hulled at picking or just before packing; there is less danger of molding if it is done at the later time, although this may mean double handling of the berries.

Picking is preferably done in the early morning.

Handling.—Because of their rapid ripening and susceptibility to molding, prompt and careful handling of berries is very essential. Bruising is to be avoided, as with raspberries. In fact, the handling procedures for the two kinds of berry are quite similar.

Strawberries should be held in the coolest place available. During longer delays, storage at about 32° F. with 85 percent humidity is possible but not for more than a day or two.

Preparation.—Sorting, hulling if done just before packing, and thorough washing especially if fruit is dusty or muddy, are required. Draining after washing should also be thorough.

Berries may be sliced, especially for mixing with sugar in 5-to-1, 4-to-1, or 3-to-1 proportions.

Berries coarsely crushed with an ordinary wire potato masher or fork, with sugar (3 to 1) carefully mixed in without beating in air, makes a good ice-cream flavor base or sundae topping. Sliced berries with sugar (3 to 1) serve the same purpose. Puree packed with the same proportion of sugar and frozen rapidly produces a smooth-textured frozen dessert. Coarse crushed fruit,

2 parts to 1 of sugar, packed with an equal amount of whole fruit, makes excellent shortcake material.

Packing.—Whole berries for dessert are preferably covered with a 40- to 50-percent sucrose sirup. They may also be packed with sugar (proportion 4 to 1 or 3 to 1), but color and flavor are not so well retained. For sugar pack, sliced or coarse-crushed strawberries are preferred.

Uses for frozen product.—Dessert, pies, cobbler, preserves, and jam. A mixture of coarse-crushed and whole berries is better for shortcake than whole fruit. Puree and pulp for sundae topping, flavor base, and Velva Fruit.

Squash

Desirable varietal characteristics.—Rich yellow color, high flavor, and smooth consistency when steamed.

Harvesting.—Harvest as is customary for winter varieties for storage. Harvest the summer varieties at a tender stage of maturity.

Handling.—Prompt handling is best, but if necessary squash may be held for a few weeks at 31° to 32° F. with 85 to 90 percent relative humidity.

Preparation.—Winter varieties: Peel, discard seeds, cut into 1-inch cubes, cook until soft, mash, and cool.

Summer varieties: Slice in half-inch pieces, scald in boiling water 3 to 4 minutes, cool in cold water, and drain; Zucchini should be sliced into quarter-inch slices, scalded in boiling water 2 to 3 minutes, cooled in cold water, and drained.

Packing.—Pack into the containers and freeze without salt solution.

Turnips

Desired varietal characteristics.—White or yellow flesh, absence of woodiness, strong flavor.

Harvesting.—Harvest as for use when fresh.

Handling.—Prompt handling is best, but turnips may be held for some time in cool storage. During such storage, close watch should be kept for the development of mold and rot.

Preparation.—Cut off the tops, wash, and peel. Dice into quarter-inch cubes and scald in boiling water or steam 2 to 3 minutes. Cool in fresh cold water, and drain.

Packing.—Pack into the containers and freeze without salt solution.

Vegetable Greens

See spinach for such vegetable greens as kale, Swiss chard, beet tops, mustard greens, and collards.

Vegetables, Pureed

The preparation of the vegetable for pureeing is essentially the same as for the whole or cut frozen product. After cooling, the vegetable is put through a food chopper and strained or freed from undesirable fibrous material.

After filling the containers, the pureed product should be frozen very promptly because the action of pureeing and the extra handling involved will tend to make the product more susceptible to microbial spoilage.

Another procedure suggested has been to cook the vegetables until soft and then to mash, cool them quickly, and freeze promptly after packaging. Tomato puree made of the cooked vegetable may be frozen alone or in combination with other pureed vegetables.

Youngberries

See dewberries.



